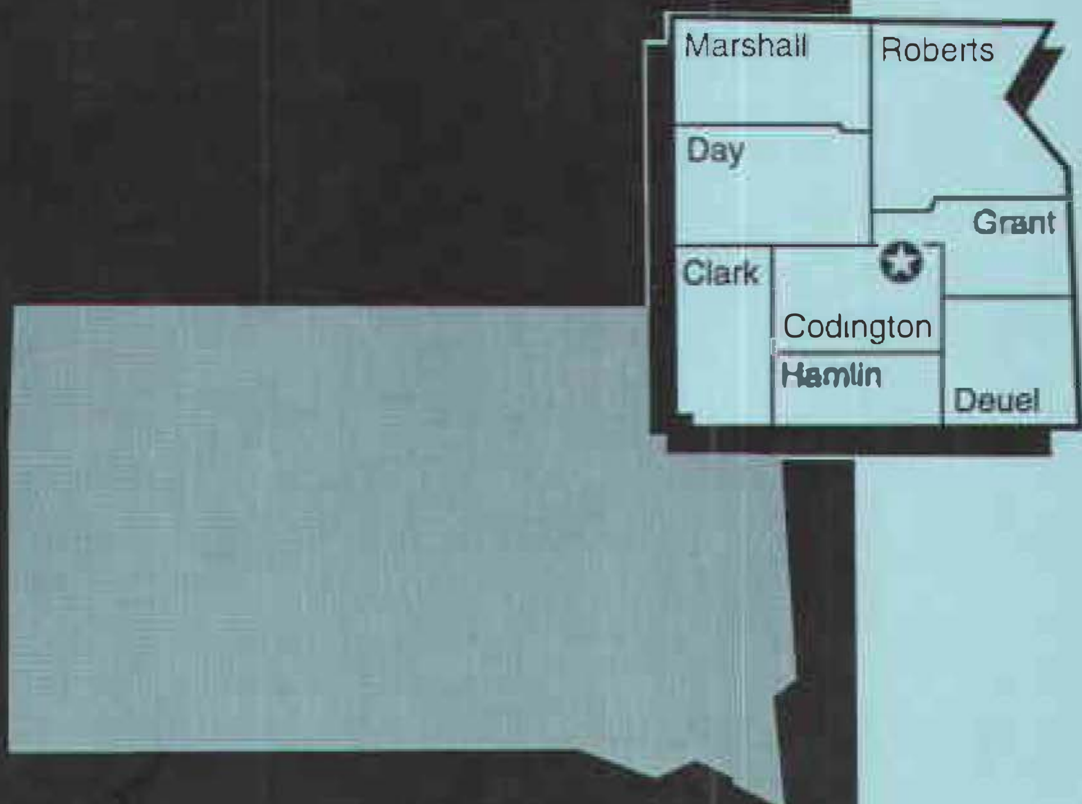
Plant Science Pamphlet No. 79
January 1995

# 1994 Annual Progress Report

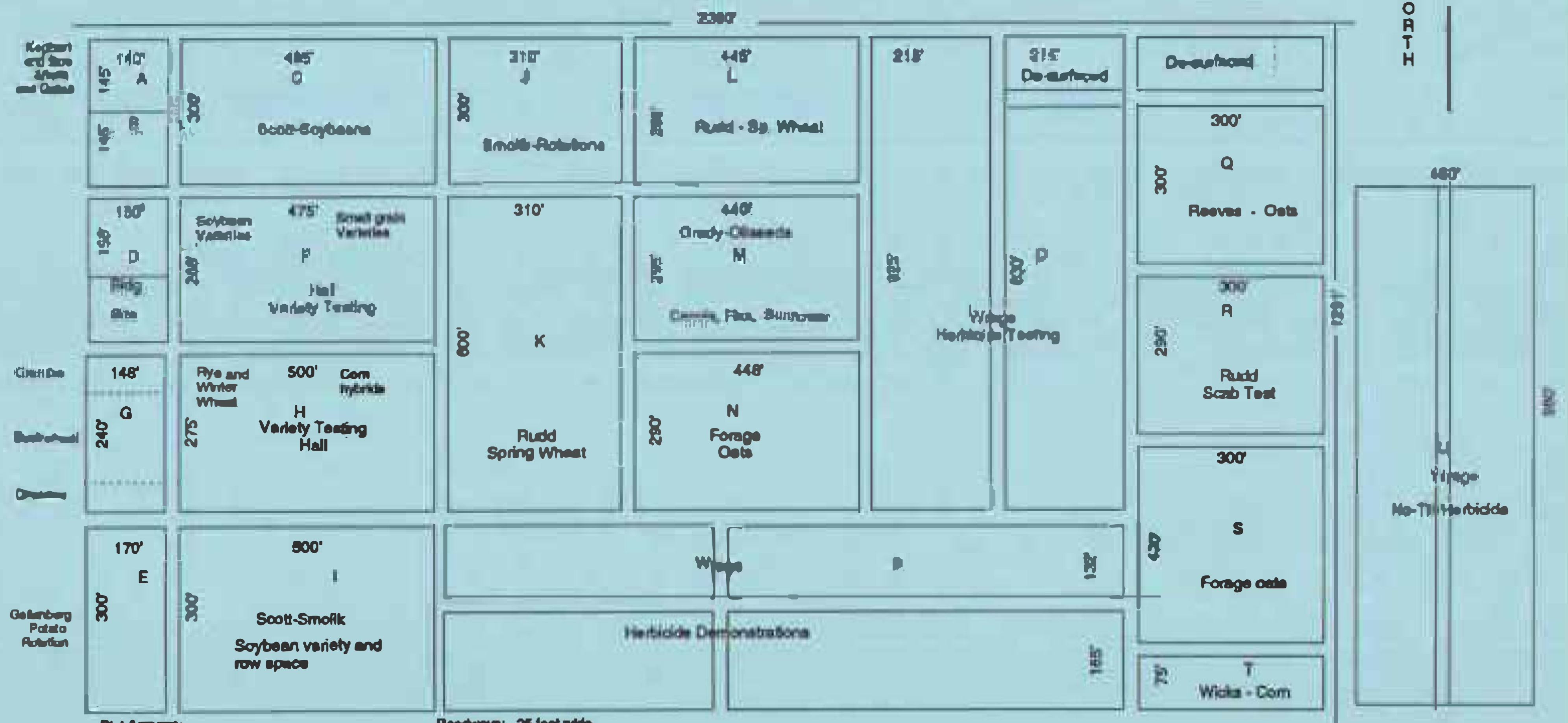
## Northeast Research Station
## Watertown, South Dakota





**Plant Science Department**
South Dakota State University
Brookings, South Dakota 57007

Northeast Research Station (Watertown)
1994 Land Use Plans




Plot Acreage:

| | | | | | |
|---|---|---|---|---|---|
| A | 0.49 | H | 3.15 | O | 9.57 |
| B | 0.49 | I | 3.44 | P | 8.65 |
| C | 3.40 | J | 2.13 | Q | 2.06 |
| D | 0.54 | K | 4.27 | R | 2.00 |
| E | 1.20 | L | 3.00 | S | 3.00 |
| F | 3.12 | M | 3.00 | T | 0.51 |
| G | 0.86 | N | 2.98 | U | 9.72 |

Roadways: 25 feet wide
Acreage in farm: 80
Experimental Acreage: 68

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## ANNUAL PROGRESS REPORT, 1994

**Northeast Research Station, Watertown, South Dakota**
**J. D. Smolik, Manager**

Precipitation end temperatures in April and early May were moderate, and allowed for timely planting of crops. Temperatures in mid to late May were unusually warm, and appeared to adversely influence the development of the spring wheat crop. However, row cropa developed very well. Precipitation in June and July was well above the long-term average, although temperatures generally remained moderate. These weather conditions were again conducive to the development of Fusarium head scab in spring wheat, but not to the extent recorded in 1993. Other diseases, including rust and tan spot, were also evident in the small grain crops. Oat yields were slightly higher than the previous year, while barley yields were slightly lower.

Temperatures and precipitation in August and September were moderate, and highly favorable for development of row crops. Both corn and soybean yields were very good, and soybean yields were at near record levels for this location. Sclerotinia rot, especially the head phase, developed to a moderate extent on sunflowers, and no doubt reduced yields. Forage crop yields, in general, were very good.

The frost-free period (temperatures above 28°F) was April 30 - October 9, resulting in a longer than normal growing season. The long growing season was particularly beneficial to the Group I soybean varieties, which have suffered substantial frost damage in several of the previous seasons. Precipitation from April through October was 5.39 inches above the long-term average (Table 1). The lowest temperature recorded at the station in 1994 was -38° F on February 9, and the highest temperature was 90° F on June 14.

Two tours were held in 1994 and although the summer tour was delayed several days due to rain, attendance at both tours was very good. Summer tour topics included row crop and small grain herbicides, small grain varieties, insect and disease updates, minor oilseeds, spring wheat breeding, and forage crops. The fall tour emphasized row crops, and included soybean varieties, effects of row spacings, and replant considerations, as well as corn population studies, fertilizer studies, fungicides for scab control, and forage crop performance. We thank Orrin Korth and family for their assistance with harvesting operations. Thanks also to Nick Endres for providing wagons for use at the tours and to the area Crop Improvement Associations for sponsoring the evening lunch following the summer tour.

<u>Note:</u> Much of the information in this report is based on ongoing studies, and results should therefore be considered tentative. The use of trade names in this publication is not en endorsement of the product by either the Plant Science Department or the Agricultural Experiment Station.

Special thanks to Donna Peterson for her assistance in the preparation of this report.

Table 1. Growing Season Precipitation* (inches) 1956-1994

| Year | April | May | June | July | Aug. | Sept. | Oct. | Total | Frost-Free Days |
|---|---|---|---|---|---|---|---|---|---|
| 1956 | 1.80 | 2.88 | 6.56 | 4.02 | 6.25 | 0.70 | 2.44 | 24.65 | 125 |
| 1957 | 4.26 | 5.98 | 2.85 | 0.74 | 5.26 | 2.12 | 3.12 | 24.33 | 119 |
| 1958 | 1.41 | 1.49 | 2.65 | 2.68 | 0.57 | 0.81 | 0.18 | 9.79 | 116 |
| 1959 | 0.58 | 3.47 | 1.91 | 1.66 | 4.69 | 1.10 | 1.95 | 15.36 | 110 |
| 1960 | 1.53 | 3.84 | 4.05 | 0.79 | 1.03 | 1.30 | 1.50 | 14.04 | 123 |
| 1961 | 2.16 | 5.75 | 4.01 | 4.62 | 0.62 | 1.84 | 1.00 | 20.00 | 138 |
| 1962 | 1.39 | 5.48 | 3.98 | 10.36 | 1.89 | 1.39 | 1.11 | 25.60 | 143 |
| 1963 | 1.41 | 3.54 | 3.22 | 5.74 | 2.51 | 4.33 | 0.68 | 21.43 | 158 |
| 1964 | 2.39 | 1.07 | 3.62 | 2.01 | 4.22 | 0.93 | 0.04 | 14.28 | 92 |
| 1965 | 2.89 | 6.08 | 3.66 | 2.34 | 2.63 | 4.33 | 1.23 | 23.16 | 104 |
| 1966 | 1.49 | 0.77 | 1.88 | 2.19 | 4.59 | 1.53 | 1.52 | 13.97 | 138 |
| 1967 | 0.92 | 0.69 | 4.58 | 1.05 | 1.13 | 1.06 | 0.35 | 9.78 | 129 |
| 1968 | 3.04 | 2.15 | 3.18 | 2.39 | 1.53 | 2.56 | 2.00 | 16.85 | 132 |
| 1969 | 1.52 | 3.44 | 1.96 | 4.52 | 2.48 | 1.86 | 2.18 | 17.96 | 109 |
| 1970 | 2.00 | 1.98 | 2.07 | 2.29 | 1.00 | 1.66 | 2.01 | 13.01 | 148 |
| 1971 | 1.33 | 1.78 | 7.61 | 1.02 | 2.93 | 1.46 | 5.56 | 21.69 | 168 |
| 1972 | 1.90 | 7.73 | 2.92 | 6.35 | 2.57 | 0.11 | 1.37 | 22.95 | 172 |
| 1973 | 1.14 | 2.87 | 1.12 | 2.05 | 1.27 | 3.81 | 1.39 | 13.65 | 183 |
| 1974 | 1.22 | 3.37 | 1.45 | 2.09 | 3.70 | 0.22 | 0.91 | 12.96 | 141 |
| 1975 | 4.15 | 2.18 | 4.76 | 1.25 | 2.89 | 2.28 | 1.64 | 19.15 | 139 |
| 1976 | 1.10 | 1.26 | 1.49 | 0.51 | 0.79 | 1.62 | 0.57 | 7.34 | 144 |
| 1977 | 2.64 | 2.24 | 5.78 | 2.47 | 2.70 | 3.67 | 3.06 | 22.56 | 180 |
| 1978 | 3.38 | 5.15 | 2.26 | 2.08 | 2.43 | 2.32 | 0.53 | 18.15 | 178 |
| 1979 | 3.14 | 2.17 | 5.78 | 3.10 | 5.21 | 0.53 | 3.50 | 23.43 | 162 |
| 1980 | 0.43 | 3.09 | 4.97 | 1.96 | 3.82 | 0.72 | 0.68 | 15.67 | 150 |
| 1981 | 0.48 | 0.99 | 2.73 | 2.23 | 1.20 | 0.52 | 1.88 | 10.03 | 136 |
| 1982 | 0.35 | 5.50 | 1.37 | 4.05 | 0.64 | 2.73 | 3.11 | 17.75 | 175 |
| 1983 | 0.70 | 1.64 | 3.43 | 5.45 | 3.00 | 2.86 | 1.30 | 18.38 | 140 |
| 1984 | 2.88 | 1.66 | 7.45 | 1.85 | 3.09 | 1.14 | 4.69 | 22.76 | 147 |
| 1985 | 1.93 | 3.90 | 2.07 | 5.21 | 3.65 | 3.77 | 1.59 | 22.12 | 167 |
| 1986 | 5.55 | 4.64 | 3.62 | 4.14 | 3.11 | 4.19 | 0.13 | 25.38 | 159 |
| 1987 | 0.55 | 2.03 | 1.20 | 4.16 | 5.64 | 2.44 | 0.45 | 16.47 | 162 |
| 1988 | 0.59 | 2.76 | 0.69 | 0.86 | 4.03 | 2.98 | 0.22 | 12.13 | 144 |
| 1989 | 2.95 | 1.15 | 1.74 | 2.41 | 4.58 | 1.56 | 0.56 | 14.95 | 147 |
| 1990 | 1.04 | 2.26 | 5.13 | 3.73 | 2.58 | 2.16 | 1.78 | 18.68 | 136 |
| 1991 | 4.01 | 4.41 | 10.45 | 2.69 | 4.37 | 1.45 | 0.63 | 28.01 | 146 |
| 1992 | 0.91 | 1.45 | 7.95 | 3.08 | 0.75 | 3.17 | 0.02 | 17.33 | 154 |
| 1993 | 1.69 | 2.53 | 6.58 | 6.70 | 1.40 | 2.05 | 0.17 | 21.12 | 149 |
| 1994 | 2.48 | 2.12 | 6.11 | 4.65 | 3.67 | 2.47 | 2.11 | 23.61 | 162 |
| AVG: | 1.93 | 3.01 | 3.82 | 3.12 | 2.83 | 1.99 | 1.52 | 18.22 | 144 |

*1960-1962, 1973-1976, 1978 and 1979 data obtained from Watertown FAA station.

# 1994 CROP PERFORMANCE TRIALS - SPRING WHEAT, DURUM WHEAT, WINTER WHEAT, OATS, AND BARLEY

R.G. Hall

**HR Spring Wheat:** Test trial results for 1994 are shown in Table 2. The yield average of 31.4 bushels per acre and test weight average of 51.6 lbs per bushel was 11 bushels higher and 10.1 lbs higher, respectively, than in 1993. The top yield group for 1994 had to yield 34.3 bushels per acre or more (highest entry of 38.5 minus LSD value of 4.2 equals 34.3 bushels per acre). The top yielding entries for 1994 were 'MN 0437', 'SD 0007', 'SD 00010', 'SD 0014', and 'BERGEN'. Likewise, the top bushel weight entries had to weigh 51.5 lbs or higher to be in the top bushel weight group. This year's bushel weight was higher than last year's but it was still lower than desired. Although *Fusarium* head scab was not devastating to the wheat crop this year as compared to last year it did affect this test and some other tests (Brookings) to some extent. The proteins for 1994 averaged 14.7% and ranged from 13.6 to 16.0%.

**Durum Wheat:** Test trial results for 1994 are shown in Table 3. Compared to 1993, this year's durum yield average of 24.4 bushels per acre and bushel weight of 37.4 lbs was 8.8 bushels higher and 9 lbs higher, respectively. Although the average yield was higher this year there were no significant yield or bushel weight differences among the varieties tested. Again as in the hard red spring wheats, *Fusarium* head scab was evident but not to the extent that it was in 1993. The proteins for 1994 averaged 14.5% and ranged from 13.1 to 15.0%.

**Winter Wheat:** Yields of winter wheat were generally good, and the test average was 53.7 bushels/acre. The highest yielding varieties were Quantum 566 and Arapahoe at 71.6 and 67.1 Bu/A, respectively (Table 3). Some *Fusarium* head scab was evident in the winter wheat trial, but yields were not severely reduced. The test weight for the trial averaged 59.0 lbs/bu. SD89153 was the highest test weight variety at 62.2 lbs/bu, and SD 89180, SD 89119, Longhorn, and Quantum 566 all tested over 61 lbs/bu.

**Oats:** Test trial results for 1994 are shown in Table 4. The 1994 oat yields were slightly higher than in 1993. The average yield of 88.1 bushels per acre and bushel weight of 34.7 lbs in 1994 was 6.5 bushels per acre and 5.4 lbs per bushel higher than a year ago. The top performing variety for 1994 was 'TROY' which yielded 122 bushels per acre. Since no other entry yielded within 10.5 bushels per acre ( the LSD (5%) value of 10.5 ) of 'TROY' it alone was the top performing oat at Watertown for 1994. The top bushel weight entries had to weigh more than 38.0 lbs to be in the top bushel weight group, i.e., the highest bushel weight was 39.7 lbs minus the test LSD value of 1.7 lbs equals 38.0 lbs per bushel. The only top bushel weight variety was 'HYTEST'. Proteins for 1994 averaged 14.7% and ranged from 11.2 to 16.7%.

**Barley:** Trial results for 1994 are shown in Table 5. The 1994 barley yields were lower than in 1993. The average yield (51.5 bushels per acre) and bushel weight (43.9 lbs) in 1994 was 11.2 bushels per acre and 3.1 lbs per bushel lower than a year ago. Entries had to yield more than 50.9 bushels per acre to be in the top yield group for 1994. The top yield group included 'M-66', 'B1602', 'B2912', 'STARK', 'SANDER', ' ROBUST', 'EXCEL', 'MOREX', and 'ROYAL'. To be in the top bushel weight group entries had to weigh more than 55.5 lbs. The top bushel weight entry was 'RICHARD', a hulless variety, from Canada. The proteins for 1994 averaged 11.9% and ranged from 11.1 to 12.9%.

Table 2. 1994 HR SPRING WHEAT YIELD RESULTS AT THE NORTHEAST RESEARCH FARM, WATERTOWN, SOUTH DAKOTA.

| VARIETY | AVERAGE YIELD - BU/ACRE 1994 N=4 | 2-YR. N=8 | 3-YR. N=12 | 1994 BUSHEL WEIGHT (LBS) N=4 | 1994 PROTEIN (%) N=1 |
|---|---|---|---|---|---|
| MN0437 | 38.5 | . | . | 55.2 | 14.2 |
| SD0007 | 38.4 | . | . | 56.1 | 13.7 |
| SD0010 | 37.6 | 33.0 | . | 53.5 | 14.5 |
| SD0014 | 36.3 | . | . | 54.5 | 14.0 |
| BERGEN | 34.7 | 28.0 | 35.2 | 54.1 | 13.6 |
| GRANDIN | 34.2 | 27.5 | 34.5 | 54.2 | 14.7 |
| SD3151 | 34.0 | . | . | 54.4 | 15.1 |
| ND XW398 | 33.0 | . | . | 50.7 | 15.4 |
| BUTTE 86 | 32.6 | 26.4 | 36.8 | 52.5 | 14.9 |
| SD8073 | 32.5 | 29.5 | 39.6 | 51.1 | 15.0 |
| SHARP | 32.5 | 28.0 | 36.8 | 53.3 | 15.1 |
| 2375 | 31.9 | 30.2 | 40.0 | 53.5 | 14.8 |
| SD3156 | 31.7 | . | . | 51.3 | 14.1 |
| PROSPECT | 31.5 | 24.6 | 34.7 | 52.1 | 14.3 |
| NORM | 31.3 | 24.8 | 34.8 | 52.2 | 13.9 |
| KULM | 30.8 | 28.8 | . | 51.6 | 15.7 |
| NORDIC | 30.7 | 24.2 | 33.6 | 53.8 | 13.7 |
| SONJA | 30.6 | 23.6 | 32.0 | 51.2 | 15.3 |
| DALEN | 30.3 | 22.9 | 32.7 | 49.5 | 15.1 |
| 2371 | 29.9 | 22.6 | 31.1 | 49.6 | 16.0 |
| VANCE | 29.1 | 22.0 | 30.7 | 49.6 | 15.0 |
| KRONA | 28.4 | 23.3 | 32.5 | 47.4 | 14.6 |
| GUARD | 27.8 | 24.6 | 32.3 | 53.1 | 14.4 |
| ND673 | 26.8 | . | . | 49.3 | 16.2 |
| AMIDON | 25.6 | 19.4 | 30.5 | 45.6 | 13.6 |
| STOA | 25.1 | 19.6 | 29.1 | 45.8 | 15.1 |
| ND677 | 24.9 | . | . | 46.1 | 15.2 |
| CHRIS,CK | 23.5 | 15.9 | 24.0 | 54.6 | 14.4 |
| AVERAGE: | 31.2 | 24.9 | 33.4 | 51.6 | 14.7 |
| LSD (5%): | 4.2 | 5.4 | 4.8 | 4.6 | |
| CV (%): | 9.5 | 11.4 | 11.1 | | |

Table 3. 1994 DURUM WHEAT YIELD RESULTS AT THE NORTHEAST RESEARCH FARM, WATERTOWN, SOUTH DAKOTA.

| | AVERAGE YIELD - BU/ACRE | | | 1994 BUSHEL WEIGHT (LBS) | 1994 PROTEIN (%) |
|---|---|---|---|---|---|
| VARIETY | 1994 N=4 | 2-YR. N=8 | 3-YR. N=12 | N=4 | N=1 |
| WARD | 27.8 | 26.3 | 33.6 | 49.1 | 14.3 |
| VOSS | 24.9 | . | . | 45.4 | 14.8 |
| RENVILLE | 24.7 | 20.4 | 28.4 | 45.2 | 14.6 |
| ND8460 | 24.5 | . | . | 45.4 | 15.0 |
| VIC, CHECK | 23.6 | 18.7 | 25.4 | 48.6 | 14.6 |
| MONROE | 23.3 | 20.7 | 26.4 | 46.1 | 13.1 |
| FJORD | 22.3 | 18.3 | 25.8 | 45.0 | 14.8 |
| AVERAGE: | 24.4 | 20.9 | 27.9 | 46.4 | 14.5 |
| LSD (5%): | NS | NS | 4.3 | NS | |
| CV (%): | 10.9 | 11.3 | 9.1 | | |

Table 3. (continued) Winter Wheat Yields at Northeast Station

| Variety | Yield (Bu/A) | Variety | Yield (Bu/A) |
|---|---|---|---|
| Quantum 566 | 71.6 | Siouxland | 53.9 |
| Arapahoe | 67.1 | Tomahawk | 53.7 |
| SD 89333 | 66.2 | Rose | 53.5 |
| SD 89186 | 63.3 | Seward | 52.5 |
| SD 89153 | 62.9 | Redland | 52.2 |
| Longhorn | 61.8 | NE 89522 | 52.2 |
| SD 89180 | 61.4 | HBC 197F | 52.0 |
| SD 89119 | 60.1 | Jules | 51.5 |
| Quantum 549 | 59.2 | Scout 66 | 50.0 |
| SD 89205 | 58.9 | Sage | 49.9 |
| Vista | 58.9 | TAM 107 | 48.7 |
| NE 88427 | 56.9 | Thunderbird | 46.4 |
| Dawn | 56.3 | Roughrider | 44.0 |
| Alliance | 55.9 | Abilene | 42.0 |
| Ike | 55.2 | Arlin | 41.6 |
| NE 89526 | 54.9 | NE 87612 | 35.8 |
| Karl 92 | 54.8 | | |

Lsd .05 = 9.4

Table 4. 1994 OAT YIELD RESULTS AT THE NORTHEAST RESEARCH FARM, WATERTOWN, SOUTH DAKOTA.

| VARIETY | AVERAGE YIELD - BU/ACRE 1994 N=4 | 2-YR. N=8 | 3-YR. N=12 | 1994 BUSHEL WEIGHT (LBS) N=4 | 1994 PROTEIN (%) N=1 |
|---|---|---|---|---|---|
| TROY | 122.0 | 118.9 | 133.8 | 37.3 | 15.4 |
| SDTROY-81 | 107.1 | . | . | 35.8 | 16.1 |
| MILTON | 103.0 | 97.4 | . | 36.3 | 14.7 |
| SDTROY-59 | 102.3 | . | . | 35.9 | 14.9 |
| IL86-1995 | 101.1 | . | . | 33.7 | 14.0 |
| NEWDAK | 100.3 | 90.0 | 116.6 | 32.8 | 16.7 |
| SDTROY-7 | 100.0 | 108.3 | . | 36.4 | 14.3 |
| WIX5673-2 | 99.2 | . | . | 32.3 | 13.2 |
| SDTROY-12 | 96.5 | 115.1 | . | 37.1 | 14.7 |
| JERRY | 93.8 | 93.1 | . | 35.9 | 15.4 |
| VALLEY | 92.1 | 77.2 | 102.2 | 35.9 | 14.3 |
| SD89504 | 88.3 | 98.3 | . | 36.3 | 14.4 |
| DANE | 87.8 | 92.6 | 116.5 | 31.3 | 12.3 |
| DON | 86.0 | 78.8 | 98.4 | 32.8 | 11.2 |
| HAZEL | 85.6 | 79.4 | 100.4 | 34.7 | 14.8 |
| HYPRO | 81.7 | . | . | 31.0 | 14.9 |
| SD90128 | 80.6 | . | . | 35.7 | 16.6 |
| HYYIELDER | 80.3 | . | . | 31.7 | 14.9 |
| SD89210 | 79.9 | 89.7 | . | 34.5 | 14.7 |
| SETTLER | 78.9 | 87.1 | 102.5 | 34.0 | 14.9 |
| SD90198 | 75.5 | . | . | 37.1 | 15.9 |
| PREMIER | 75.2 | 66.2 | 86.7 | 35.4 | 13.7 |
| SD90134 | 73.4 | . | . | 35.8 | 17.0 |
| HYTEST | 71.6 | 56.5 | 84.5 | 39.7 | 14.1 |
| BURNETT | 66.7 | 50.1 | 82.9 | 33.3 | 12.8 |
| PAL | 62.7 | . | . | 29.2 | 16.0 |
| AVERAGE: | 88.1 | 87.4 | 102.5 | 34.7 | 14.7 |
| LSD (5%): | 10.5 | 32.1 | 21.9 | 1.7 | |
| CV (%): | 8.5 | 9.2 | 7.1 | | |

Table 5. 1994 BARLEY YIELD RESULTS AT THE NORTHEAST RESEARCH FARM, WATERTOWN, SOUTH DAKOTA.

| VARIETY | AVERAGE YIELD - BU/ACRE 1994 N=4 | 2-YR. N=8 | 3-YR. N=12 | 1994 BUSHEL WEIGHT (LBS) N=4 | 1994 PROTEIN (%) N=1 |
|---|---|---|---|---|---|
| M-66 | 58.1 | . | . | 42.2 | 12.2 |
| B1602 | 56.8 | 61.8 | 80.0 | 42.0 | 12.4 |
| B2912 | 56.7 | . | . | 40.4 | 11.9 |
| STARK | 55.1 | 60.1 | 77.8 | 45.0 | 11.9 |
| STANDER | 54.3 | 60.7 | 80.8 | 41.7 | 11.1 |
| ROBUST | 54.1 | 58.8 | 74.9 | 41.7 | 11.8 |
| EXCEL | 53.6 | 61.9 | 81.5 | 40.9 | 12.0 |
| MOREX | 53.0 | 55.8 | 69.1 | 41.2 | 11.4 |
| ROYAL | 51.6 | . | . | 41.1 | 12.9 |
| ND-11055 | 50.3 | 57.5 | 73.9 | 40.0 | 12.2 |
| BUCK | 49.8 | 49.3 | . | 55.3 | 12.2 |
| ND11231-11 | 47.9 | . | . | 44.0 | 11.7 |
| GALLATIN | 45.4 | 47.0 | 62.5 | 41.8 | 11.1 |
| RICHARD | 45.3 | 47.2 | . | 57.0 | 11.5 |
| BOWMAN | 40.8 | 49.4 | 63.5 | 44.9 | 12.0 |
| AVERAGE: | 51.5 | 55.4 | 73.8 | 43.9 | 11.9 |
| LSD (5%): | 7.2 | 9.2 | 8.1 | 1.5 | |
| CV (%): | 9.8 | 9.0 | 7.9 | | |

## 1994 CROP PERFORMANCE TRIALS - CORN AND SOYBEANS

R.G. Hall

**Corn:** The early and late test trial results for corn (seeded May 11, 1994) are shown in Tables 6 and 7, respectively. The early test averages for 1994 were: yield - 133.3 bushels per acre, harvest moisture - 19.6%, and bushel weight - 57.1 lbs per bushel. These were a change of + 97 bushels per acre, - 6.8% moisture, and + 19.1 lbs per bushels, respectively, from 1993. There were 10 entries in this test yielding 139.8 bushels or higher which placed them in the top yielding group. Likewise, those entries with a harvest moisture content of 18% or less and a bushel weight of 58.6 lbs or higher were in the top performing group in these categories. The late test averages for 1994 were: yield - 142.8 bushels per acre, harvest moisture - 22.6%, and bushel weight - 57.8 lbs per bushel. These were a change of + 94.4 bushels per acre, - 7.2% moisture, and + 18.9 lbs per bushel, respectively, from 1993. In 1994 there were three entries in this test yielding 161.2 bushels or higher which placed them in the top yielding group. In addition, entries with a harvest moisture of 21.5% or less and a bushel weight of 58.7 or higher were in the top performing group in these categories.

**Soybean:** The maturity group-0 and group-I soybeans yields are shown in Tables 8 and 9. The group-0 trial averaged 50.1 bushels per acre for 1994. Nine varieties yielded 55.8 bushels or higher and were therefore in the top yielding group for 1994. Over the longer term, varieties averaged 38.7 and 33.8 bushels per acre, respectively, for the recent two- and three-year periods. Likewise, the group-I trial averaged 52.3 bushels per acre for 1994. Fourteen varieties yielded 56.7 bushels or higher and were therefore in the top yielding group for 1994. Over the longer two and three-year periods, group -I varieties averaged 39.4 and 32.8 bushels per acre, respectively.

Compared to 1993 the yield test trials at Watertown were much better than in 1994. Timely seeding, good moisture distribution, a longer growing season, and warmer temperatures in 1994 resulted in better overall cropping conditions for corn and soybeans.

Table 6. 1994 CORN HYBRID PERFORMANCE TRIAL RESULTS - WATERTOWN, SD, N.E. RESEARCH FARM, EARLY MATURITY - 95 DAYS OR LESS.

| ----- BRAND & HYBRID ----- | YIELDS AT 15.5% MOIST. (BU/AC) | 1994 HARVEST MOIST. (%) | 1994 BUSHEL WEIGHT (LB) |
|---|---|---|---|
| CIBA 4214 | 152.9 | 19.8 | 57.4 |
| PIONEER 3861 | 148.9 | 18.5 | 57.7 |
| CENEX/LOL 351 | 148.0 | 19.7 | 57.7 |
| CENEX/LOL 375 | 147.8 | 20.4 | 56.3 |
| KALTENBERG K4709 | 146.2 | 19.7 | 55.0 |
| CARGILL 2497 | 144.5 | 19.5 | 57.9 |
| DEKALB DK 442 | 143.6 | 19.5 | 56.9 |
| TOP FARM SX2194 | 143.1 | 20.0 | 58.7 |
| KALTENBERG K4800 | 142.0 | 22.3 | 56.3 |
| DEKALB DK 401 | 140.9 | 17.7 | 57.3 |
| HYBRIDS APPEARING ABOVE THIS LINE ARE IN THE TOP-YIELD-GROUP FOR 1994 | | | |
| SEXAUER SX450 | 139.7 | 21.5 | 51.9 |
| KALTENBERG K4400 | 139.7 | 19.4 | 57.7 |
| CENEX/LOL 5954 | 139.2 | 20.1 | 56.4 |
| DEKALB DK 381 | 139.1 | 17.8 | 56.4 |
| CENEX/LOL 289 | 139.0 | 20.1 | 58.9 |
| ASGROW RX350 | 138.8 | 18.3 | 58.4 |
| LEGEND LS7494 | 138.5 | 20.6 | 56.9 |
| G. HARVEST H-2292 | 138.1 | 19.2 | 56.7 |
| KALTENBERG K3809 | 137.9 | 19.6 | 57.8 |
| DYNA-GRO 15095 | 137.7 | 20.0 | 56.0 |
| N. KING N-2555 | 137.7 | 19.1 | 60.2 |
| PAYCO 413 | 137.4 | 19.8 | 56.0 |
| ICI N8910IT | 137.2 | 19.6 | 57.8 |
| CIBA 4144 | 136.5 | 19.8 | 57.3 |
| CIBA 4172 | 136.5 | 19.4 | 57.4 |
| SANDS SOI9944 | 136.1 | 19.7 | 58.5 |
| ASGROW XP4102 | 136.0 | 19.6 | 56.7 |
| N. KING N-3030 | 135.5 | 19.2 | 57.5 |
| MYCOGEN 3440 | 134.5 | 20.4 | 56.1 |
| DAIRYLAND ST-1187 | 133.9 | 18.8 | 58.2 |
| MYCOGEN 4440 | 133.6 | 21.4 | 52.1 |
| SEXAUER SX420 | 131.3 | 20.4 | 57.9 |
| DYNA-GRO 5243 | 130.8 | 19.2 | 58.2 |
| PIONEER 3893 | 130.5 | 19.0 | 57.8 |
| TOP FARM SX1193 | 130.4 | 19.8 | 56.9 |

Table 6. (continued)

| ----- BRAND & HYBRID ----- | YIELDS AT 15.5% MOIST. (BU/AC) | 1994 HARVEST MOIST. (%) | 1994 BUSHEL WEIGHT (LB) |
|---|---|---|---|
| DOMESTIC DX306 | 129.4 | 19.0 | 54.6 |
| AGRIPRO AP162 | 129.1 | 20.1 | 57.1 |
| PIONEER 3905 | 128.3 | 18.8 | 60.0 |
| G. HARVEST H-2295 | 128.0 | 19.9 | 58.5 |
| KAYSTAR KX-550 | 127.7 | 20.5 | 56.6 |
| N. KING N-2933 | 126.1 | 19.6 | 58.6 |
| CIBA 4120 | 125.7 | 19.4 | 55.7 |
| KAYSTAR KX-490 | 125.0 | 20.3 | 58.3 |
| CARGILL 2927 | 124.8 | 18.5 | 56.4 |
| MYCOGEN 2880 | 122.8 | 19.8 | 57.9 |
| TOP FARM SX2195 | 122.7 | 20.8 | 57.0 |
| DOMESTIC DX407 | 121.0 | 20.1 | 55.4 |
| PAYCO 444 | 120.5 | 19.3 | 55.4 |
| LEGEND LS5953 | 120.2 | 20.5 | 58.3 |
| CENEX/LOL 5862 | 117.2 | 20.8 | 59.9 |
| STINE 951 | 116.5 | 19.4 | 55.1 |
| DAIRYLAND ST-1284 | 111.3 | 17.9 | 57.6 |
| LEGEND LS6479 | 105.0 | 17.3 | 59.2 |
| TEST AVERAGE: | 133.3 | 19.6 | 57.1 |
| TEST LSD (5%) VALUE: | 13.2 | 0.8 | 1.7 |
| MINIMUM BEST VALUE: | 139.8 | | 58.6 |
| MAXIMUM BEST VALUE: | | 18.0 | |
| TEST C.V.#: | 6.1 | | |

#COEF. OF VARIATION - A MEASURE OF EXPERIMENTAL ERROR; IF VALUE EXCEEDS 16.0% DATA SHOULD NOT BE USED TO MAKE HYBRID COMPARISONS.

Table 7. 1994 CORN HYBRID PERFORMANCE TRIAL RESULTS - WATERTOWN, SD, N.E. RESEARCH FARM, LATE MATURITY - 96 DAYS OR MORE.

| ----- BRAND & HYBRID ----- | YIELDS AT 15.5% MOIST. (BU/AC) | 1994 HARVEST MOIST. (%) | 1994 BUSHEL WEIGHT (LB) |
|---|---|---|---|
| CARGILL 4277 | 174.9 | 24.7 | 55.0 |
| DEKALB DK 493 | 164.7 | 21.4 | 58.6 |
| PIONEER 3733 | 163.9 | 22.7 | 60.4 |
| HYBRIDS APPEARING ABOVE THIS LINE ARE IN THE TOP-YIELD-GROUP FOR 1994 | | | |
| DEKALB DK 471 | 161.0 | 21.3 | 56.9 |
| CARGILL 4327 | 157.7 | 25.3 | 55.1 |
| TOP FARM SX2103 | 150.9 | 24.5 | 58.2 |
| G. HARVEST H-2390 | 149.0 | 24.3 | 56.9 |
| ICI 8751 | 148.2 | 20.7 | 58.6 |
| N. KING N-4242 | 146.9 | 22.8 | 57.7 |
| SEXAUER SX510 | 144.9 | 20.6 | 58.1 |
| DEKALB DK 512 | 144.2 | 22.9 | 55.6 |
| DYNA-GRO 15099 | 143.9 | 23.3 | 58.4 |
| G. HARVEST H-2382 | 142.8 | 24.3 | 58.1 |
| PIONEER 3769 | 142.5 | 21.4 | 57.1 |
| G. HARVEST H-2404 | 141.4 | 24.1 | 58.9 |
| SANDS SOI9031 | 141.1 | 21.2 | 57.5 |
| KALTENBERG K4805 | 140.5 | 21.6 | 58.3 |
| PAYCO 614 | 140.1 | 20.6 | 58.3 |
| PAYCO 531 | 137.3 | 21.2 | 57.4 |
| MYCOGEN 4970 | 134.5 | 22.9 | 58.4 |
| DYNA-GRO 5100 | 132.7 | 23.1 | 57.9 |
| SANDS SOI9991 | 131.7 | 21.4 | 56.6 |
| CIBA 4273 | 131.6 | 22.5 | 59.3 |
| STINE 993 | 130.4 | 21.6 | 56.2 |
| TOP FARM SX1097A | 130.3 | 21.5 | 57.4 |
| SANDS SOI9980 | 129.9 | 22.9 | 58.9 |
| MYCOGEN 5270 | 128.0 | 23.5 | 57.5 |
| MYCOGEN 3560 | 127.9 | 22.6 | 60.1 |
| SANDS SOI9040 | 127.1 | 24.8 | 57.5 |
| TEST AVERAGE: | 142.8 | 22.6 | 57.8 |
| TEST LSD (5%) VALUE: | 13.8 | 1.0 | 1.8 |
| MINIMUM BEST VALUE: | 161.2 | | 58.7 |
| MAXIMUM BEST VALUE: | | 21.5 | |
| TEST C.V.#: | 5.9 | | |

#COEF. OF VARIATION - A MEASURE OF EXPERIMENTAL ERROR; IF VALUE EXCEEDS 16.0% DATA SHOULD NOT BE USED TO MAKE HYBRID COMPARISONS.

Table 8. 1994 SOYBEAN VARIETY PERFORMANCE TRIAL RESULTS-WATERTOWN, SD. N.E. RESEARCH FARM, MATURITY GROUP-0, SEEDED MAY 13, 1994.

| ---- BRAND ---- | --- VARIETY --- | ----- YIELDS ----- 1994 | 2-YR. | 3-YR. | ---- 1993 ---- PROTEIN | OIL |
|---|---|---|---|---|---|---|
| | | ----- (BU/A) | | ----- | ---- (%) | ---- |
| PAYCO | 9409 | 60.3 | . | . | . | . |
| KRUGER | K-0909 | 59.0 | . | . | . | . |
| MUSTANG | E-0830 | 58.6 | . | . | . | . |
| PRAIRIE BRAND | PB-104 | 58.1 | . | . | . | . |
| ------ | SL92-1323M | 57.7 | . | . | . | . |
| PIONEER | 9092 | 56.7 | . | . | . | . |
| ------ | SL92-1763M | 56.0 | . | . | . | . |
| KRUGER | K-0999 | 56.0 | . | . | . | . |
| ------ | SL92-1233M | 55.8 | . | . | . | . |
| ENTRIES APPEARING ABOVE THIS LINE ARE IN THE TOP YIELD GROUP FOR 1994 | | | | | | |
| MUSTANG | M-1050 | 55.4 | 41.0 | 37.1 | 35.2 | 16.1 |
| ------ | PARKER I-CK* | 55.2 | . | . | . | . |
| DAIRYLAND | DSR109 | 54.7 | 43.8 | . | 32.1 | 16.6 |
| ------ | SL92-1272M | 54.3 | . | . | . | . |
| ------ | SL92-1357M | 54.0 | . | . | . | . |
| KRUGER | K-0909A | 53.8 | . | . | . | . |
| NORTHRUP KING | S09-95 | 53.7 | . | . | . | . |
| ------ | SL92-1461M | 53.3 | . | . | . | . |
| MUSTANG | E-0990 | 53.3 | . | . | . | . |
| DYNA-GRO | 3033 | 53.2 | . | . | . | . |
| MYCOGEN | S74 | 52.0 | . | . | . | . |
| ------ | DAWSON 0-CK* | 51.9 | 42.1 | 37.5 | 34.0 | 15.7 |
| ------ | HENDRICKS | 51.5 | 44.5 | 38.1 | 35.1 | 16.2 |
| ARROWHEAD | 8350 | 51.4 | 39.9 | 37.7 | 34.5 | 15.1 |
| ------ | SL92-1401M | 51.4 | . | . | . | . |
| KRUGER | K-0919 | 51.0 | . | . | . | . |
| PIONEER | 9071 | 50.8 | 42.8 | . | 33.2 | 17.5 |
| DEKALB | CX096 | 50.7 | 39.1 | 34.4 | 35.3 | 15.5 |
| MUSTANG | M-1000 | 50.3 | 38.4 | 33.3 | 35.4 | 15.1 |
| ------ | SIMPSON | 50.3 | 42.4 | 36.6 | 35.0 | 16.1 |
| GOLDEN HARVEST | X078 | 50.1 | . | . | . | . |
| GOLD COUNTRY | ROSCOE | 49.6 | 39.0 | . | 35.0 | 16.3 |
| HILLCREST | HC091 | 49.5 | 38.3 | 33.8 | 35.2 | 15.4 |
| PAYCO | 0010 | 49.5 | 38.2 | . | 34.8 | 15.7 |
| ICI | EX4092 | 49.4 | . | . | . | . |

Table 8. (continued)

| ---- BRAND ---- | --- VARIETY --- | ----- YIELDS ----- 1994 | 2-YR. | 3-YR. | ---- 1993 ---- PROTEIN | OIL |
|---|---|---|---|---|---|---|
| | | ----- (BU/A) | | ----- | ---- (%) | ----- |
| ZILLER | BT1330 | 49.3 | . | . | . | . |
| MUSTANG | M-0770 | 49.1 | 42.5 | . | 34.9 | 16.2 |
| MUSTANG | E-0880 | 49.0 | . | . | . | . |
| HY-VIGOR | 1480 | 48.9 | . | . | . | . |
| ------ | LAMBERT | 48.7 | 40.4 | 35.2 | 35.6 | 17.0 |
| ------ | GLENWOOD | 47.8 | 36.6 | 31.2 | 35.1 | 16.3 |
| ARROWHEAD | 8450 | 47.7 | 37.0 | 32.0 | 35.4 | 15.2 |
| PAYCO | 9410 | 47.7 | . | . | . | . |
| SEXAUER | SX0332 | 47.7 | . | . | . | . |
| SEXAUER | SX0832 | 47.3 | 37.9 | . | 34.4 | 16.4 |
| TOP FARM | TF 0100 | 47.3 | 37.3 | . | 34.5 | 16.5 |
| KALTENBERG | KB053 | 47.1 | 41.5 | . | 35.1 | 16.5 |
| DAIRYLAND | DSR068 | 47.0 | 38.0 | . | 34.2 | 15.5 |
| DAIRYLAND | DSR045 | 46.9 | . | . | . | . |
| GOLD COUNTRY | BOYD | 46.7 | . | . | . | . |
| ------ | ND88597 | 46.2 | . | . | . | . |
| SEXAUER | SX0451 | 46.1 | . | . | . | . |
| ------ | OZZIE | 45.0 | 38.2 | 32.7 | 35.8 | 15.5 |
| ------ | EVANS | 43.7 | 38.7 | 33.0 | 35.8 | 15.6 |
| GOLDEN HARVEST | H-1075 | 43.6 | 37.0 | . | 34.4 | 16.0 |
| ------ | DASSEL | 43.3 | 36.5 | 33.0 | 34.2 | 16.3 |
| AGRIPRO | AP0919 | 42.7 | 39.2 | . | 35.9 | 15.3 |
| ------ | AGASSIZ | 38.6 | 30.2 | 24.7 | 35.3 | 16.7 |
| ------ | M87-731 | 36.6 | . | . | . | . |
| ------ | MC CALL 00-CK* | 32.4 | 24.8 | 23.8 | 34.5 | 17.3 |
| TEST AVERAGES: | | 50.1 | 38.7 | 33.4 | 34.8 | 16.1 |
| LSD (5%) VALUES: | | 4.6 | 7.3 | 5.8 | | |
| MIN. VALUE FOR HIGH YIELD: | | 55.8 | 37.3 | 32.4 | | |
| COEFFICIENT OF VARIATION (CV): | | #5.6 | 6.8 | 7.4 | | |

*CK = CHECK VARIETY.
#CV - A MEASURE OF EXPERIMENTAL ERROR; IF VALUE EXCEEDS 16.0% DATA SHOULD NOT BE USED TO MAKE VARIETY COMPARISONS.

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Table 9. 1994 SOYBEAN VARIETY PERFORMANCE TRIAL RESULTS-WATERTOWN, SD. N.E. RESEARCH FARM, MATURITY GROUP-I, SEEDED MAY 13, 1994.

| BRAND | VARIETY | YIELDS 1994 | 2-YR. | 3-YR. | 1993 PROTEIN | OIL |
|---|---|---|---|---|---|---|
| | | (BU/A) | | | (%) | |
| DESOY | D-1819 | 62.6 | . | . | . | . |
| DESOY | D-1777 | 60.2 | . | . | . | . |
| DESOY | D-1999 | 59.4 | . | . | . | . |
| ARROWHEAD BRAND | 8495 | 59.4 | . | . | . | . |
| PAYCO | 9314 | 59.2 | 46.2 | . | 34.5 | 15.8 |
| STINE | 1570 | 59.0 | . | . | . | . |
| MUSTANG | E-1122 | 58.9 | . | . | . | . |
| GOLDEN HARVEST | H-1196 | 58.6 | 44.3 | 37.8 | 35.3 | 14.5 |
| KRUGER | K-1414+ | 58.6 | . | . | . | . |
| PROFISEED | PS 1504 | 58.5 | . | . | . | . |
| CIBA | 3144 | 58.1 | . | . | . | . |
| DESOY | D-1707 | 57.5 | . | . | . | . |
| KRUGER | K-1818+ | 57.5 | . | . | . | . |
| SANDS | SOI 113 | 56.7 | 45.6 | . | 34.4 | 16.4 |
| ENTRIES APPEARING ABOVE THIS LINE ARE IN THE TOP-YIELD-GROUP FOR 1994 | | | | | | |
| ICI | D138 | 56.3 | 44.0 | . | 35.5 | 15.3 |
| KRUGER | K-1909 | 56.1 | . | . | . | . |
| ------ | SL92-1412M | 56.1 | . | . | . | . |
| PAYCO | 9319 | 56.1 | . | . | . | . |
| KRUGER | K-1444 | 56.0 | . | . | . | . |
| KSC/CHALLENGER | K1717+ | 55.7 | . | . | . | . |
| KRUGER | K-1313+ | 55.6 | . | . | . | . |
| PAYCO | 9419 | 55.4 | . | . | . | . |
| ------ | SL92-1328M | 54.6 | . | . | . | . |
| GOLDEN HARVEST | H-1140 | 54.4 | . | . | . | . |
| ZILLER | BT1510 | 54.4 | . | . | . | . |
| TOP FARM | TF 1334 | 54.1 | 43.7 | . | 34.8 | 15.8 |
| ------ | SL92-2844M | 54.1 | . | . | . | . |
| MUSTANG | M-1170 | 53.8 | 43.3 | . | 34.4 | 16.3 |
| ARROWHEAD BRAND | 8600 | 53.5 | 39.3 | 35.4 | 33.5 | 15.6 |
| GOLD COUNTRY | KANDI | 53.1 | . | . | . | . |
| PIONEER | 9111 | 52.6 | 42.3 | 36.8 | 35.5 | 16.0 |
| ------ | SL92-1362M | 52.5 | . | . | . | . |
| KRUGER | K-1716 | 52.3 | . | . | . | . |
| ------ | SL92-1201M | 52.1 | . | . | . | . |

Table 9. (continued)

| ---- BRAND ---- | --- VARIETY --- | ----- YIELDS ----- 1994 | 2-YR. | 3-YR. | ---- 1993 ---- PROTEIN | OIL |
|---|---|---|---|---|---|---|
| | | ----- (BU/A) | | ----- | ---- (%) | ----- |
| ASGROW | A1395 | 52.0 | 42.0 | . | 35.0 | 15.4 |
| ------ | M87642 | 51.9 | . | . | . | . |
| ------ | SL92-1207M | 51.1 | . | . | . | . |
| ------ | STURDY II-CK* | 51.1 | . | . | . | . |
| PIONEER | 9141 | 50.7 | 41.7 | . | 34.1 | 15.7 |
| ------ | SL92-1194M | 50.7 | . | . | . | . |
| MUSTANG | M-1140 | 50.4 | 40.1 | 34.8 | 35.4 | 15.1 |
| ------ | PARKER I-CK* | 50.0 | 41.5 | 36.6 | 35.4 | 15.4 |
| HILLCREST | HC311 | 49.5 | 37.8 | . | 33.6 | 15.7 |
| ------ | BELL-SCN-CK | 49.2 | 37.1 | 29.4 | 34.1 | 14.9 |
| ------ | WEBER | 49.1 | 35.7 | 31.5 | 34.1 | 15.0 |
| GREAT LAKES | GL1927 | 49.0 | . | . | . | . |
| ------ | KASOTA | 48.6 | 37.8 | 33.5 | 35.4 | 15.7 |
| ------ | SIBLEY | 48.6 | 39.3 | 35.3 | 35.1 | 15.0 |
| ------ | LESLIE | 48.5 | 34.6 | 28.7 | 34.3 | 15.4 |
| ZILLER | BT1422 | 48.2 | . | . | . | . |
| SANDS | SOI 135 | 48.1 | . | . | . | . |
| DEKALB | CX117 | 47.9 | 40.1 | 36.3 | 33.3 | 16.1 |
| ------ | KATO | 47.9 | 38.4 | 33.5 | 37.0 | 15.3 |
| ------ | HARDIN | 47.8 | 37.2 | 30.6 | 35.8 | 15.0 |
| ------ | BERT | 47.5 | 36.0 | 31.1 | 34.4 | 15.2 |
| DYNA-GRO | 3038 | 47.5 | . | . | . | . |
| DEKALB | CX121 | 47.3 | 39.0 | 32.3 | 34.9 | 16.1 |
| AGRIPRO | AP1347 | 47.3 | . | . | . | . |
| MUSTANG | E-1127 | 47.1 | . | . | . | . |
| MYCOGEN | AG112 | 46.8 | . | . | . | . |
| ------ | BSR-101 | 45.1 | 32.9 | 28.8 | 35.0 | 14.9 |
| ------ | SL92-1179M | 44.1 | . | . | . | . |
| GOLDEN HARVEST | H-1112 | 43.5 | 38.1 | 33.5 | 34.2 | 17.1 |
| ------ | ALPHA | 42.4 | 31.6 | 26.6 | 35.7 | 14.1 |
| ------ | DAWSON 0-CK* | 37.8 | 35.6 | 31.6 | 34.4 | 15.9 |
| TEST AVERAGES: | | 52.3 | 39.4 | 32.8 | 34.8 | 15.5 |
| LSD (5%) VALUES: | | 6.0 | 7.7 | 6.0 | | |
| MIN. VALUE FOR HIGH YIELD: | | 56.7 | 38.6 | 31.9 | | |
| COEFFICIENT OF VARIATION (CV): | | #7.1 | 8.3 | 9.2 | | |

*CK = CHECK VARIETY.
#CV - A MEASURE OF EXPERIMENTAL ERROR; IF VALUE EXCEEDS 16.0% DATA SHOULD NOT BE USED TO MAKE VARIETY COMPARISONS.

# 1994 OAT RESEARCH

Dale Reeves and Lon Hall

The preliminary herbicide screening test is a cooperative effort with the oat project and the extension weed staff to screen established varieties and promising lines for herbicide injury. Recommended and doubled rates are applied to four varieties or lines at the 3-4 leaf stage. These data show MCPA amine, Bronate, and the low rate of MCPA + Dicamba caused the least injury; however, this may change with the variety, location, year, or stage of plant development. Generally, MCPA amine caused the least amount of injury. Yield was reduced in the check due heavy weed pressure. Other data has shown plants are more sensitive to Bronate applied in the 6-7 leaf stage.

| HERBICIDE | (ai/a) | YIELD (bu/a) | YLD% of check | TWT (lb/b) |
|---|---|---|---|---|
| CHECK | | 82.7 | 100 | 32.7 |
| MCPA AM. | .5 | 89.3 | 108 | 33 |
| MCPA AM. | 1 | 92.3 | 112 | 34.6 |
| 2,4-D AM. | .5 | 88.4 | 107 | 33.6 |
| 2,4-D AM. | 1 | 80.7 | 98 | 33.4 |
| BRONATE | .75 | 91.1 | 110 | 32.1 |
| BRONATE | 1 | 87.9 | 106 | 31.9 |
| DICAMBA + MCPA AM | .125 + .25 | 89.8 | 109 | 32 |
| DICAMBA + MCPA AM | .25 + .5 | 81.6 | 99 | 30.2 |
| MEAN | | 87.1 | 105 | 32.6 |
| LSD.05** 7.8 | | | | |
| LSD.1 # 6.4 | | | | |

Herbicidal injury varies with environmental conditions, therefore, several location-years are needed to show overall effects and interactions with variety, herbicide, and environment.

The breeding nurseries consist of lines selected for this region on the basis of maturity and disease resistance. The uniform midseason nursery had 36 lines and the regional hulless nursery had 25 lines from several states and Canada. These two nurseries are grown at several locations throughout the United States and Canada; the data collected is used to determine which lines should be considered for release as varieties. An oat foliar fungicide test was also conducted with the cooperation of the extension pathologists. The results show foliar treatment increases in yield and test weight. A total of 812 yield plots were tested overall.

# Forage Yield of Stockpiled Yellow-flowered and Hay-type Alfalfas

Arvid Boe, Robin Bortnem, Susan Anderson, Ed Twidwell, and Kevin Kephart

Introduction: There is expanding interest in the northern Great Plains in the use of alfalfa for both wildlife habitat and forage purposes. Pheasants end ducks utilize alfalfa fields as nesting sites in spring and early summer in our region. However, haying procedures in early June often destroy nests, eggs, and incubating hens. Yellow-flowered alfalfa (*Medicago sativa* ssp. *falcata*) has several traits that lead us to believe it offers promise for this purpose. It has high levels of winter hardiness and drought tolerance, prolonged flowering, and more tolerance than common hay and pasture types to potato leafhopper yellowing. Canada milk-vetch (*Astragalus canadensis*) is a native legume that is found in a variety of habitats across all but the extreme southeastern and southwestern United States. Because of its vigorous growth in a wide variety of environments, it appears to have potential for revegetation and forage purposes.

Objective: Our objective waa to compare *M. sativa* ssp.*falcata* germplasms and Canada milk-vetch to standard hay- and pasture-type alfalfas (*M. sativa* ssp. *sativa* and *M. sativa* ssp. *varia*) for yield of forage stockpiled until late July to enhance gamebird production in the northern Great Plains.

Materials and Methods: Eight cultivars and 10 experimental populations of alfalfa and 4 experimental populations of Canada milk-vetch were planted at a rate of 12 lbs pure live seed/acre in 4 replicate single-row plots on May 13, 1993. Row length was 9 feet and the between-row spacing was 3 feet. The experiment was harvested for forage yield and quality determinations on July 26, 1994.

Results and Discussion: The overall mean dry matter forage yields for the alfalfa and Canada milk-vetch entries were 3.17 and 3.20 tons/acre, respectively. The highest-yielding alfalfa entries under this 1-cut stockpiling aystem were experimental germplasms with high levels of *M. sativa* ssp. *falcata* in their genetic backgrounds. However, during the summer of 1994 atands of some entries were reduced due to standing water after high rainfall. Unfortunately, this precludes accurate statistical analysis and comparisons of entries for forage yield. This experiment was valuable from ths standpoint of providing some information on the forage yield of Canada milk-vetch and the potential of *M. sativa* ssp. *falcata* germplasm for use in developing alfalfa cultivars adapted to stockpiling until mid July to enhance gamebird production.

**Foxtail Dalea**

**Robin Bortnem, Arvid Boe, and Susan Anderson**

Introduction: Foxtail dalea is a native annual legume that is found in sandy prairies and disturbed sites in eastern South Dakota. It flowers from July to September and produces abundant seed that does not easily shatter. Because of its late maturity, good seed production, and erect growth habit, this legume has potential for green manure, forage, or conservation.

Objective: Our objective was to evaluate forage production in mid and late summer for two foxtail dalea populations. The two populations were light- and heavy-seeded selections from a collection made near Elk Point, SD.

Materials and Methods: Plots of foxtail dalea were seeded at 13.5 PLS/acre on May 17, 1994 in a 3-replicate experiment of 3 x 25 foot plots with 6-inch row spacings. Treatments consisted of two seed weights [heavy- (bulked seed from progeny of heavy-seed-weight parents) and light- (bulked seed from progeny of light-seed-weight parents)], and 2 harvest dates (August 1 and September 1).

Results and Discussion: Highly significant ($P<0.01$) differences were found between harvest dates for dry matter forage yield. The September 1 harvest (3.5 t/acre) was almost double the August 1 harvest (1.9 t/acre). Heavy-seeded selections produced significantly higher forage yields than the light-seeded selections (2.9 and 2.4 t/acre, respectively).

Forage quality parameters from the 2 harvest dates will be evaluated this winter. So far results indicate foxtail dalea has high forage-yield-production potential in eastern South Dakota. Because it's later maturing than most other annual legumes, it may be particularly useful as a late summer forage.

## Forage Production of Cowpeas and Millets

E.K. Twidwell, A. Boe, K.D. Kephart,
R. Bortnem, and S. Anderson

Introduction: Many of the perennial grasses and legumes commonly grown for hay or pasture in northeastern South Dakota produce only limited amounts of forage in July and August, particularly in dry years. Two species that may provide forage during this time period include cowpeas and foxtail millet. Cowpeas are a warm-season annual legume that have yielded between 0.5 and 2 tons per acre in SDSU studies. Foxtail millet is a warm-season annual grass that is commonly grown in northeastern South Dakota. It generally produces about 1 to 2 tons of forage per acre. Pearl millet is grown for forage primarily in the southern Great Plains. Limited information is currently available on the productivity of pearl millet in northeastern South Dakota. The objective of this study was to determine the effects of harvest date on dry matter yield of five cowpea varieties and two millet species.

Materials and Methods: The cowpea varieties Catjang, Chinese Red, Brabham, Victor, and Red Ripper were hand-planted on May 25 into 1-row plots measuring 10 feet in length. The spacing between rows was 3 feet. All varieties except Red Ripper were planted at a rate of 20 grams per row. Red Ripper was planted at a rate of 25 grams per row because of hard seed content. 'Manta' foxtail millet and 'Mil-Hy' pearl millet were hand-planted into 1-row plots measuring 10 feet in length at a rate of 10 grams per row. Experimental design was a factorial arrangement of harvest date and variety (cowpeas) or species (millet) in a randomized complete block with four replicates. Harvests occurred 9, 11, and 13 weeks after planting. For pearl millet, the regrowth from each initial harvest was harvested on September 27. These regrowth yields were added to the initial harvest yields. For both cowpea and millet studies, the entire row was hand-harvested at a 2-inch stubble height. Forage was weighed in the field. A one-pound subsample was taken and dried. Forage dry matter yield was calculated from total plot fresh weight and dry matter concentration data.

Results and Discussion: For the cowpea study, there was not a significant interaction between variety and harvest date. However, the main effect of variety was significant. When averaged across three harvest dates, the cowpea varieties Chinese Red, Catjang, and Victor produced similar yields. These yields were all significantly higher than yields of Red Ripper and Brabham (Table 10). The main effect of harvest date was also significant, and mean forage yield of cowpeas increased from 840 to 2595 lbs/acre when harvest date was delayed from 9 to 13 weeks after planting. These yields in 1994 are about 30% higher than those obtained in 1993. This yield difference is probably due to the drier and warmer conditions recorded in 1994 as compared to 1993.

When averaged across three harvest dates, yield of pearl millet was about 2.5 times higher than that of foxtail millet. This large yield difference was probably caused by foxtail millet being harvested once, whereas yields of pearl millet included an initial harvest plus the regrowth. These results indicate that producers may be able to harvest pearl millet initially at the boot stage, let the plants regrow, and then either graze the regrowth or take another harvest for hay. Pearl millet makes an excellent choice as a forage for grazing in the fall since it does not have the potential for prussic acid toxicity like sudangrass or sorghum-sudangrass hybrids. Pearl millet has a thicker stem than foxtail millet, and will take longer to cure as a hay crop.

The one-pound subsamples taken from each plot of cowpea and millet are currently being analyzed for crude protein (CP) concentration and in vitro digestible dry matter (IVDDM). Results obtained in 1993 indicate that when averaged across three harvest dates, cowpea CP concentration and IVDDM was about 22 and 68%, respectively. For the millet study, both foxtail and pearl millets had CP concentrations of about 13%. For IVDDM, however, foxtail and pearl millets had values of 55 and 65%, respectively.

Table 10. Forage yields of five cowpea varieties and two millet species.[1]

| Cowpea | Yield | Millet | Yield |
|---|---|---|---|
| | -lb/acre- | | -lb/acre- |
| Red Ripper | 1440 | Foxtail | 4343 |
| Chinese Red | 1733 | Pearl | 10,935[2] |
| Brabham | 1371 | LSD(0.05) | 1155 |
| Catjang | 1824 | | |
| Victor | 1841 | | |
| LSD(0.05) | 270 | | |

[1] All values are the means of three harvest dates
[2] Values include initial harvest plus regrowth

# ALFALFA CULTIVAR YIELD TEST

E.K. Twidwell, K.D. Kephart, R. Bortnem,
A. Boe, and S. Anderson

One alfalfa cultivar yield experiment was conducted at the NE station during 1994. This test was conducted to determine yield performance of alfalfa cultivars and experimental lines for use in NE South Dakota.

Four harvests were obtained from the experiment planted in 1993. Average four-cut total yield in 1994 was 4.94 T/A, and significant cultivar differences were detected (Table 11). Average yields for the four harvests in 1994 ranged from 1.01 T/A for the fourth harvest to 1.59 T/A for the first harvest. Significant cultivar differences were found within each cutting. Yields for the public cultivars Vernal, Riley, and Baker ranked near the bottom in terms of cultivar yield rankings.

An important role of the South Dakota Alfalfa Cultivar Yield Test is to evaluate lines that are in experimental stages of breeding programs. Companies and universities often enter promising alfalfa lines to test their suitability to stressful conditions in South Dakota. There are 12 experimental entries in the current experiment at the NE station. Results for experimental lines must be interpreted with caution. Seed for these lines are in early generations of the seed production process and natural inbreeding depression is expected as these lines are advanced to seed production stages. In essence, commercial seed derived from experimental lines may not have the same yield potential that that was observed in a state variety trial.

These results are useful in selection of alfalfa cultivars for forage production. Measurements of forage yield taken over several harvests and years are usually more useful than are averages from a single harvest.

Table 11. Forage yield of 29 alfalfa cultivars planted May 12, 1993 at the Northeastern Research Station, Watertown, SD.

| Cultivar | 1993 2-Cut Total | 1994 Cut 1 6/3 | Cut 2 7/12 | Cut 3 8/16 | Cut 4 9/27 | 4-Cut Total | % of 1994 Average |
|---|---|---|---|---|---|---|---|
| | tons DM / acre | | | | | | - % - |
| ABI 9222 (experimental entry) (a) | 2.51 | 1.86 | 1.37 | 1.19 | 1.17 | 5.58 | 113 |
| Garst 645 | 2.89 | 1.79 | 1.45 | 1.19 | 1.13 | 5.56 | 113 |
| ABI 9126 (experimental entry) | 2.80 | 1.81 | 1.42 | 1.27 | 1.03 | 5.52 | 112 |
| Arrow | 2.68 | 1.73 | 1.44 | 1.21 | 1.12 | 5.50 | 111 |
| 5262 | 2.58 | 1.73 | 1.37 | 1.26 | 1.10 | 5.45 | 110 |
| Majestic | 2.37 | 1.69 | 1.37 | 1.21 | 1.16 | 5.43 | 110 |
| Dart | 2.61 | 1.75 | 1.36 | 1.20 | 1.11 | 5.42 | 110 |
| Defiant (experimental entry) | 2.48 | 1.82 | 1.34 | 1.19 | 0.99 | 5.34 | 108 |
| 5246 | 2.20 | 1.73 | 1.32 | 1.17 | 1.08 | 5.29 | 107 |
| Saranac AR | 2.59 | 1.60 | 1.33 | 1.11 | 1.18 | 5.22 | 106 |
| Dawn | 2.80 | 1.65 | 1.31 | 1.20 | 1.02 | 5.18 | 105 |
| Dominator | 2.69 | 1.60 | 1.34 | 1.06 | 1.09 | 5.09 | 103 |
| STX6 (experimental entry) | 2.39 | 1.57 | 1.33 | 1.15 | 1.01 | 5.06 | 102 |
| LegenDairy | 2.02 | 1.68 | 1.28 | 1.09 | 1.01 | 5.06 | 102 |
| 5454 | 2.05 | 1.50 | 1.23 | 1.18 | 1.06 | 4.97 | 101 |
| W6040 (experimental entry) | 2.14 | 1.62 | 1.26 | 1.10 | 0.99 | 4.97 | 101 |
| WL 323 | 2.10 | 1.42 | 1.23 | 1.19 | 1.12 | 4.97 | 101 |
| ABI 8939 (experimental entry) | 2.38 | 1.57 | 1.28 | 1.07 | 1.04 | 4.97 | 101 |
| 3452-ML | 2.26 | 1.54 | 1.28 | 1.11 | 1.03 | 4.94 | 100 |
| WL 322HQ | 2.44 | 1.38 | 1.22 | 1.17 | 1.06 | 4.83 | 98 |
| MS92 (experimental entry) | 2.30 | 1.49 | 1.27 | 0.98 | 1.08 | 4.82 | 98 |
| Wisyn-C (experimental entry) | 1.82 | 1.50 | 1.20 | 1.02 | 1.03 | 4.73 | 96 |
| Vernal | 2.09 | 1.50 | 1.27 | 0.96 | 0.87 | 4.60 | 93 |
| SDHL1-SSL (experimental entry) | 2.08 | 1.68 | 1.19 | 0.88 | 0.87 | 4.59 | 93 |
| Riley | 1.84 | 1.46 | 1.19 | 0.98 | 0.95 | 4.58 | 93 |
| Baker | 2.30 | 1.48 | 1.16 | 0.91 | 0.89 | 4.45 | 90 |
| SDHL1-LLL (experimental entry) | 1.65 | 1.35 | 1.08 | 0.82 | 0.68 | 3.93 | 79 |
| SDHL1-SSS (experimental entry) | 1.64 | 1.43 | 0.99 | 0.72 | 0.67 | 3.80 | 77 |
| SDHL1-LLS (experimental entry) | 1.55 | 1.27 | 0.88 | 0.64 | 0.63 | 3.42 | 69 |
| AVERAGE | 2.28 | 1.59 | 1.27 | 1.08 | 1.01 | 4.94 | |
| Maturity (b) | | 3.8 | 4.4 | 3.8 | 2.9 | | |
| LSD (0.05) | 0.79 | 0.33 | 0.21 | 0.21 | 0.18 | 0.84 | |

(a) Data for experimental lines should be used with caution. Commercial seed for these lines may not perform similarly.

(b) Kalu and Fick (1983) maturity index, mean stage by count.

# 1994 Flax, Canola, and Crambe Variety Trials at the Northeast Research Station

Kathleen A. Grady

## FLAX

A yield trial of released flax varieties and experimental lines from SO, NO and Canada was grown at the Northeast Research Station and two other locations in 1994. The purpose of the trial was to provide performance data on released varieties to producers and compare performance of experimental lines to established checks in order to identify possible new varieties.

In 1994, 10 experimental lines from the SDSU flax breeding program were tested against 16 named varieties (checks) and 7 advanced lines from ND and Canada. The trial was seeded on April 22, 1994 at the Northeast Research Farm. Experiment design was a randomized complete block with 3 replications. Plots consisted of 7 rows 14.5 ft. long, with rows spaced 7 in. apart. Stands were good.

The growing season was very good for flax, with adequate rainfall and moderate temperatures. The plots were harvested by cutting the middle three rows of each plot with a bundle cutter, then drying and threshing the bundles. Oil content was determined by NMR analysis of oven-dry seed samples and converted to a 10% moisture basis. Oil yield was calculated by multiplying seed yield by oil content.

Seed and oil yields, % oil, and height data on the 33 entries in the test are presented in Table 12. The average yield across all varieties was 37.7 bu/A. Thia was about 14 bu/A higher than a similar test at the NE Farm in 1993. The highest yielding check variety in 1994 was Linora (43.5 bu/A). The highest yielding experimental was CI 3353, which yielded 42.8 bu/A.

## CANOLA

South Dakota participated in a cooperative regional canola variety trial in 1994. Participating states were South Dakota, North Dakota, Minnesota and Wisconsin. Each state grew the same set of 9 check varieties (6 Argentine and 3 Polish types) and then solicited additional entries from canola companies on a fee basis. Funding for testing of the 9 checks was provided by a USOA/CSRS grant.

Six additional varieties besides the 9 checks were entered in the South Dakota trials. We grew the trial at 2 locations, Brookings (Table 13) and the Watertown Northeast Research Station (Table 14). Plots consisted of seven rows approximately 15 ft. long, rows spaced 7 in. apart. Brookings was seeded on April 21 and Watertown on April 19, 1994. Stands were good at both locations.

Growing conditions were generally good, although there was a period of hot, dry weather at Brookings near the onset of flowering. Some bird damage also occurred at Brookings as plots were nearing maturity. Plots were harvested on several different dates due to maturity differences among the 15 varieties. All plots were straight-combined with a Hege plot combine.

Seed yield, oil content, days to beginning and end of flowering, maturity, plant height and lodging data for the 15 canola varieties are presented in Tables 13 and 14. The average yield over all varieties was 996 lbs/A at Brookings and 1225 lbs/A at the NE Farm.

## CRAMBE

A small performance trial of four Crambe varieties was also conducted at the Northeast Research Station in 1994. The purpose of the test was to determine Crambe's potential as an alternative oilseed crop for northeast South Dakota. Crambe is a relatively new oilseed crop that has had limited commercial production in North Dakota since 1991. Crambe is a member of the mustard family and its seed yields an industrial oil high in erucic acid. All commercial production of Crambe is currently grown under contract only with National Sun Industries, Inc. in Enderlin, ND. There is no open market for Crambe.

Four Crambe varieties were seeded on April 19, 1994 in a randomized complete block design with 3 replications. Plots consisted of 7 rows 15 ft. long, rows spaced 7 in. apart. Stands were good. Plots were straight-combined at maturity with a Hege plot combine.

The average yield over varieties was 1043 lbs/A (Table 15). Crambe yields in North Dakota have ranged from under 500 lbs/A to over 3000 lbs/A, depending on the year and location, so the Watertown yields were not outstanding. However, the trial indicated that Crambe will grow and produce seed in northeast South Dakota. If the market expands enough to produce a favorable price, Crambe could be considered as an alternative oilseed crop for this area of the state.

Table 12. Results of the flax South Dakota Tristate test grown at the Watertown Northeast Research Station in 1994.

| Entry | Variety | Origin-Year | Seed Yield | Yield Rank | Oil | Oil Yield | Plant Height |
|---|---|---|---|---|---|---|---|
| | | | (bu/A) | | (%) | (kg/ha) | (cm) |
| 1 | LINOTT | CAN-66 | 35.6 | 25 | 37.0 | 823 | 57 |
| 2 | DUFFERIN | CAN-75 | 37.8 | 16 | 37.9 | 894 | 56 |
| 3 | FLOR | ND-81 | 38.9* | 12 | 37.9 | 919 | 55 |
| 4 | MCGREGOR | CAN-82 | 39.9* | 5 | 37.7 | 941 | 60 |
| 5 | RAHAB | SD-85 | 34.8 | 31 | 38.4 | 834 | 55 |
| 6 | LINTON | ND-85 | 34.9 | 29 | 37.8 | 825 | 53 |
| 7 | NECHE | ND-88 | 33.5 | 33 | 38.1 | 798 | 54 |
| 8 | PROMPT | SD-89 | 35.2 | 27 | 37.9 | 835 | 58 |
| 9 | DAY | SD-90 | 33.9 | 32 | 38.7 | 821 | 58 |
| 10 | OMEGA | ND-90 | 36.0 | 23 | 39.4 | 886 | 58 |
| 11 | SOMME | CAN-90 | 36.3 | 22 | 37.1 | 840 | 60 |
| 12 | LINORA | CAN-92 | 43.5* | 1 | 39.6 | 1076* | 62 |
| 13 | FLANDERS | CAN-90 | 39.5* | 9 | 39.4 | 973* | 55 |
| 14 | RAHAB 94 | SD-94 | 37.8 | 15 | 39.0 | 921 | 55 |
| 15 | MCDUFF | CAN-93 | 35.4 | 26 | 41.7 | 923 | 53 |
| 16 | VERNE 93 | SD-93 | 34.9 | 30 | 38.3 | 837 | 57 |
| 17 | CI 3318 | CAN-exp. | 39.9* | 6 | 37.4 | 932 | 59 |
| 18 | CI 3301 | ND-exp. | 38.3 | 14 | 37.9 | 906 | 58 |
| 19 | CI 3314 | SD-exp. | 37.3 | 17 | 38.5 | 899 | 58 |
| 20 | CI 3327 | ND-exp. | 39.3* | 10 | 40.0 | 982* | 59 |
| 21 | CI 3328 | ND-exp. | 39.5* | 8 | 39.0 | 962* | 60 |
| 22 | CI 3330 | ND-exp. | 36.4 | 21 | 37.5 | 851 | 56 |
| 23 | CI 3331 | ND-exp. | 39.7* | 7 | 39.2 | 906 | 54 |
| 24 | CI 3332 | CAN-exp. | 38.9* | 11 | 37.2 | 905 | 56 |
| 25 | CI 3350 | SD-exp. | 37.0 | 19 | 40.6 | 940 | 57 |
| 26 | CI 3351 | SD-exp. | 40.7* | 4 | 38.5 | 976* | 59 |
| 27 | CI 3352 | SD-exp. | 41.7* | 3 | 38.4 | 1000* | 54 |
| 28 | CI 3353 | SD-exp. | 42.8* | 2 | 38.8 | 1037* | 62 |
| 29 | CI 3354 | SD-exp. | 35.0 | 28 | 38.5 | 843 | 58 |
| 30 | CI 3355 | SD-exp. | 38.8* | 13 | 38.7 | 939 | 58 |
| 31 | CI 3356 | SD-exp. | 35.9 | 24 | 39.3 | 882 | 59 |
| 32 | CI 3357 | SD-exp. | 37.1 | 18 | 37.9 | 878 | 56 |
| 33 | SD91E42 | SD-exp. | 36.7 | 20 | 38.6 | 889 | 56 |
| | MEAN | | 37.7 | | 38.5 | 905 | 57 |
| | LSD .05 | | 5.1 | | 1.0 | 126 | 5 |
| | C.V. | | 8.4 | | 1.7 | 8.5 | 5 |

* Indicates a variety that is in the top-yielding group based on the LSD .05.

Table 13. Results of the 1994 canola variety trial grown at Brookings, SD.

| Company | Variety | Seed Yield | Yield Rank | Oil | Days from planting to: 10% Flwr | End Flwr | Maturity | Plant* Height | Lodging |
|---|---|---|---|---|---|---|---|---|---|
| | | (lbs/A) | | (%) | | | | (cm) | (1-5) |
| Brassica napus (Argentine) varieties: | | | | | | | | | |
| Check | Legend | 992 | 8 | 39.3 | 49 | 72 | 101 | 91 | 1.3 |
| Check | Crusher | 986 | 9 | 40.7 | 55 | 77 | 108 | 96 | 1.0 |
| Check | Hyola 401 | 981 | 10 | 39.1 | 46 | 68 | 96 | 77 | 1.0 |
| Check | Impact | 870 | 12 | 39.7 | 50 | 74 | 103 | 100 | 1.3 |
| Check | Cyclone | 1291 | 2 | 39.5 | 52 | 74 | 102 | 99 | 1.0 |
| Check | Seville | 1117 | 5 | 39.2 | 51 | 78 | 107 | 99 | 1.5 |
| Pioneer Hi-Bred | Garrison | 1119 | 3 | 34.3 | 53 | 77 | 107 | 108 | 1.3 |
| Pioneer Hi-Bred | Jackpot | 1015 | 7 | 39.9 | 52 | 73 | 101 | 88 | 1.8 |
| Pioneer Hi-Bred | NSO 717 | 1117 | 4 | 41.7 | 51 | 75 | 104 | 98 | 1.3 |
| Pioneer Hi-Bred | NSO 705 | 1294 | 1 | 40.4 | 51 | 74 | 107 | 95 | 1.0 |
| Pioneer Hi-Bred | NSO 699 | 1087 | 6 | 40.1 | 56 | 76 | 106 | 95 | 1.8 |
| B. campestris (Polish) varieties: | | | | | | | | | |
| Check | Tobin | 625 | 15 | 37.2 | 42 | 64 | 86 | -- | 1.5 |
| Check | Klondike | 829 | 13 | 37.7 | 46 | 68 | 92 | -- | 1.3 |
| Check | Reward | 735 | 14 | 34.6 | 43 | 65 | 89 | -- | 1.5 |
| Pioneer Hi-Bred | Goldrush | 886 | 11 | 34.2 | 45 | 67 | 91 | -- | 1.5 |
| Mean | | 996 | | 38.5 | 49 | 72 | 100 | 95 | 1.3 |
| LSD .05 | | 173 | | | 2 | 1 | 2 | 7 | ns |
| C.V. | | 12.1 | | | 2.3 | 1.4 | 1.6 | 5.5 | 36.6 |

* Height of the Polish varieties was not measured.
Date planted: April 21, 1994.
Exp. design: RCBD with 4 replications.
Harvested plot size: 70 sq. ft.

Table 14. Results of the 1994 canola variety trial grown at Watertown, SD.

| Company | Variety | Seed Yield | Yield Rank | Oil | Days from planting to: 10% Flwr | End Flwr | Maturity | Plant Height | Lodging | Shatter |
|---|---|---|---|---|---|---|---|---|---|---|
| | | (lbs/A) | | (%) | | | | (cm) | (1-5) | (%) |
| Brassica napus (Argentine) varieties: | | | | | | | | | | |
| Check | Legend | 956 | 15 | 38.0 | 49 | -- | 102 | 103 | 2.0 | 0 |
| Check | Crusher | 1130 | 13 | 38.1 | 52 | 74 | 105 | 117 | 1.0 | 8 |
| Check | Hyola 401 | 1481 | 1 | 38.4 | 47 | 67 | 99 | 90 | 1.0 | 0 |
| Check | Impact | 988 | 14 | 38.0 | 50 | -- | 105 | 115 | 1.0 | 25 |
| Check | Cyclone | 1167 | 10 | 37.9 | 52 | -- | 103 | 107 | 1.3 | 1 |
| Check | Seville | 1278 | 7 | 38.3 | 49 | -- | 107 | 116 | 2.3 | 5 |
| Pioneer Hi-Bred | Garrison | 1300 | 3 | 37.7 | 51 | 76 | 107 | 116 | 1.8 | 0 |
| Pioneer Hi-Bred | Jackpot | 1158 | 11 | 38.1 | 50 | -- | 102 | 108 | 2.5 | 0 |
| Pioneer Hi-Bred | NSO 717 | 1152 | 12 | 38.4 | 53 | -- | 106 | 110 | 1.5 | 3 |
| Pioneer Hi-Bred | NSO 705 | 1294 | 4 | 37.9 | 50 | -- | 105 | 107 | 2.5 | 6 |
| Pioneer Hi-Bred | NSO 699 | 1283 | 6 | 38.5 | 54 | 74 | 106 | 103 | 2.5 | 0 |
| B. campestris (Polish) varieties: | | | | | | | | | | |
| Check | Tobin | 1293 | 5 | 36.7 | 42 | 64 | 86 | 92 | 1.8 | 0 |
| Check | Klondike | 1250 | 9 | 36.9 | 46 | 66 | 91 | 100 | 1.8 | 0 |
| Check | Reward | 1376 | 2 | 38.3 | 42 | 65 | 88 | 93 | 1.8 | 0 |
| Pioneer Hi-Bred | Goldrush | 1269 | 8 | 36.9 | 46 | 65 | 90 | 101 | 1.8 | 0 |
| Mean | | 1225 | | 37.8 | 49 | 69 | 100 | 105 | 1.8 | 3 |
| LSD .05 | | 169 | | | 2 | 2 | 2 | 9 | 0.8 | |
| C.V. | | 9.7 | | | 3.3 | 1.7 | 1.2 | 6.2 | 32.7 | |

Date planted: April 19, 1994.
Exp. design: RCBD with 4 replications.
Harvested plot size: 70 sq. ft.

Table 15. Results of the 1994 Crambe variety trial grown at the Northeast Research Station.

| Entry | Variety | Seed Yield | Days from planting 10% Flwr | Days from planting End Flwr | Plant Height |
|---|---|---|---|---|---|
| | | (lbs/A) | | | (cm) |
| 1 | MEYER | 843 | 50 | 70 | 56 |
| 2 | BELANN | 1130 | 54 | 76 | 75 |
| 3 | BELENZIAN | 1091 | 54 | 78 | 69 |
| 4 | NM 02 | 1109 | 50 | 74 | 73 |
| | Mean | 1043 | 52 | 75 | 68 |
| | LSD .05 | 199 | 3 | 4 | NS |
| | C.V. | 8.4 | 2.7 | 2.5 | 10.6 |

Date planted: April 19, 1994.
Exp. design: RCBD with 3 replications.
Harvested plot size: 70 sq. ft.

## 1994 Sunflower Planting Date Study
Kathleen A. Grady

### Objectives

Evaluate the effects of planting date on yield, oil content, disease level and insect damage of several sunflower hybrids of varying maturities. (Cooperative study with Dr. Murdick McLeod and Dr. Thomas Chase).

### Materials and Methods

Four sunflower hybrids were selected for this study:
1. Sunwheat 101--a very early dwarf hybrid generally maturing about 2 weeks earlier than most mid-maturity hybrids.
2. Pioneer 6230--a conventional-height, early-maturing hybrid.
3. Sigco 658--a conventional-height, mid-maturity hybrid.
4. Kaystar 9101--a conventional-height, late-maturing hybrid.

The study was conducted at 2 locations in 1994. One location was at the Northeast Research Station near Watertown, SD. The other location was in Spink County near Turton, SD. The Turton site actually included 2 separate tests in different fields. It was planned that one of the fields would be sprayed with insecticide to control seed weevils and/or head moths if they occurred, while the other would remain unsprayed. However, since seed weevil and head moth populations never reached economic threshold levels in either field, neither of the Turton tests was sprayed for insect control. The Watertown test was also not sprayed.

At each location, the 4 hybrids were planted at 8 different dates. Planned dates of planting were about every 10 days from May 1st to July 10th. Due to wet field conditions on some of the planned dates, the actual dates of planting began on May 6th at Watertown and May 11th at Turton and ranged from 6-18 days apart. The planting dates were as follows for the 2 locations:

| Dates | Watertown | Turton (Fields 1 & 2) |
|---|---|---|
| Date 1 | May 6 | May 11 |
| Date 2 | May 12 | May 17 |
| Date 3 | May 19 | May 24 |
| Date 4 | May 31 | May 31 |
| Date 5 | June 9 | June 10 |
| Date 6 | June 27 | June 22 |
| Date 7 | July 5 | July 1 |
| Date 8 | July 11 | July 12 |

Plots consisted of 6 rows of each hybrid planted at each date, replicated 4 times. Rows were 23 ft. long, spaced 30 in. apart. The experimental design was a split plot, with dates of planting as the main plots and hybrids as sub-plots.

This choice of design posed some problems in weed control. Since the dates of planting were randomly distributed throughout the field, it was not possible to work up the soil to control emerged weeds prior to planting at any but the first date. It was also not possible to cultivate the fields because there were plants at many stages of development scattered throughout the field, with some being too small to cultivate while others were too tall. Weed populations were extremely high in all 3 fields, and although plots were hand-weeded as much as possible before planting and during the growing season, some plots had to be abandoned due to excessive weed competition.

Plants in the middle 2 rows of each 6-row plot were bagged shortly after they completed flowering to protect them from bird damage. Dr. McLeod (extension entomologist) monitored seed weevil populations during the flowering period in each of the 3 fields.

Notes were taken on days from planting to flowering, plant height and lodging. A strong storm with heavy rain and 50 mph winds caused considerable lodging at Turton, particularly in Dates 1-5 of the Sigco hybrid and Dates 1-3 of the Pioneer hybrid. Many of these plots had 100% lodged plants and were not harvested. Field 2 at Turton had more severe lodging than Field 1.

The middle 2 rows of each plot were hand-harvested. Heads from the Watertown plots have been threshed and processed. Heads from the Turton fields are still being threshed, so data from that location are not yet available.

Dr. McLeod removed seed samples from each of the Watertown plots to evaluate for insect damage, but results of insect evaluations are not yet completed. Total seed yield and test weight for each plot was determined and a sample removed for oil content evaluation. Oil was determined by NMR analysis of oven-dry samples and then converted to a 10% moisture basis.

There was a significant level of Sclerotinia head rot at the Watertown location. The percent of rotted heads in each harvested plot was calculated to determine if there was an effect of planting date on the incidence of Sclerotinia head rot. Rotted heads were set aside for Dr. Chase (plant pathologist), who plans to further characterize the rot causal organisms.

**Results and Discussion—NE Research Station**

The 1994 growing season waa generally favorable for sunflower, with adequate rainfall and moderate temperatures. The first killing (28°) frost occurred later than normal, on October 9th, although plants may have been damaged by earlier lighter frosts. Mean seed yield, test weight, days to flower, plant height, % lodging, % head rot and oil content for the 4 hybrids planted at 8 different dates are contained in Tables 16-22, respectively.

Averaged over hybrids, there were no significant differences in yield among the first 3 planting dates, May 6, May 12 and May 19 (Table 16). Hybrids planted on May 31 and June 9 showed only a slight reduction in seed yield from the earlier dates, but were significantly lower yielding with each further delay in planting from June 9 to July 11.

There was a significant interaction between hybrids and planting dates for seed yield. Pioneer 6230 and Sigco 658 yielded best when planted on May 19 but Kaystar 9101 yielded significantly higher planted on May 12. The lower yields recorded for the May 6 date for Kaystar 9101 and the May 6 and May 12 dates for Pioneer 6230 and Sigco 658 could have been due to increased levels of lodging and/or head rot in the earlier-planted dates (Tables 20 and 21).

Averaged over hybrids, there was no significant difference in oil content for the first 3 planting dates (Table 22). Oil content decreased notably when the hybrids were planted on dates after May 19, particularly on dates 7 and 8 (July 5th and 11th). Test weights for the 4 hybrids are contained in Table 17. There were essentially no differences in test weight among the first 5 planting dates for any of the hybrids. Test weight dropped significantly, however, when planting was delayed until June 27 or later. The number of days from planting to flowering generally decreased as planting was delayed, particularly when the hybrids were planted on June 27 or later (Table 18). Plant height also decreased when hybrids were planted after June 9 (Table 19).

There was a significantly higher incidence of Sclerotinia head rot among hybrids planted at the 2 earliest dates (Table 21), suggesting that planting in early May may increase susceptibility or exposure to this disease, at least under conditions similar to those at Watertown in 1994. This is a significant finding, as Sclerotinia rot affects not only yield in the current year but also produces inoculum in the form of sclerotia that can persist in the soil for many years. Increased inoculum density can affect future production of sunflower and other susceptible crops and disrupt rotation schedules. Additional study of a possible relationship between Sclerotinia head rot and sunflower planting date may be warranted.

The results of this study indicate that under similar environmental conditions as those at Watertown in 1994, planting dates from mid to late May give the best yield and oil content. The results from the 2 Turton plots and the insect damage evaluations, when available, may modify these conclusions.

Table 16. Seed yield (lbs/A) of 4 sunflower hybrids planted at 8 dates at Watertown, SD in 1994.

| Seeding Date | Hybrid | | | | Date Means |
|---|---|---|---|---|---|
| | Sunwheat 101 | Pioneer 6230 | Sigco 658 | Kaystar 9101 | |
| May 6 | 1895 a | 1791 bc | 1801 ab | 2061 b | 1887 ab |
| May 12 | 1982 a | 1650 c | 1846 ab | 2501 a | 1995 a |
| May 19 | 1759 a | 2424 a | 2034 a | 1976 b | 2048 a |
| May 31 | 1330 b | 2142 ab | 1707 abc | 1792 bc | 1743 bc |
| June 9 | 1322 b | 2040 b | 1621 bc | 1538 c | 1630 c |
| June 27 | 1228 b | 1286 d | 1368 c | 948 d | 1208 d |
| July 5 | 840 c | 1032 d | 759 d | 474 e | 776 e |
| July 11 | 627 c | 618 e | 541 d | 169 e | 488 f |
| Hybrid Mean | 1373 | 1623 | 1460 | 1432 | 1472 |
| LSD .05 | 357 | 357 | 357 | 357 | 188 |

* Means in the same column followed by the same letter are not significantly different at the 5% level.

Table 17. Test weight (lbs/bu) of 4 sunflower hybrids planted at 8 dates at Watertown, SD in 1994.

| Seeding Date | Hybrid | | | | Date Means |
|---|---|---|---|---|---|
| | Sunwheat 101 | Pioneer 6230 | Sigco 658 | Kaystar 9101 | |
| May 6 | 29.1 a | 30.5 a | 33.9 a | 29.8 a | 30.8 a |
| May 12 | 28.8 a | 30.5 a | 34.5 a | 29.2 a | 30.8 a |
| May 19 | 28.6 a | 30.2 a | 32.2 ab | 29.5 a | 30.1 a |
| May 31 | 27.3 ab | 28.4 ab | 32.5 ab | 30.6 a | 29.7 a |
| June 9 | 27.2 ab | 28.2 ab | 32.1 ab | 30.2 a | 29.5 a |
| June 27 | 25.8 b | 26.7 bc | 30.2 b | 22.4 b | 26.3 b |
| July 5 | 25.0 b | 24.8 c | 24.4 c | 17.7 c | 23.0 c |
| July 11 | 22.2 c | 21.5 d | 21.8 d | 14.6 d | 20.0 d |
| Hybrid Mean | 26.8 | 27.6 | 30.2 | 26 | 27.5 |
| LSD .05 | 2.5 | 2.5 | 2.5 | 2.5 | 1.4 |

* Means in the same column followed by the same letter are not significantly different at the 5% level.

Table 18. Days to flower of 4 sunflower hybrids planted at 8 dates at Watertown, SD in 1994.

| Seeding Date | Hybrid | | | | Date Means |
|---|---|---|---|---|---|
| | Sunwheat 101 | Pioneer 6230 | Sigco 658 | Kaystar 9101 | |
| May 6 | 64 a | 70 a | 73 a | 81 ab | 72.1 a |
| May 12 | 62 b | 67 c | 71 bc | 79 c | 69.8 b |
| May 19 | 62 b | 69 ab | 72 ab | 80 bc | 70.6 b |
| May 31 | 64 a | 67 c | 70 cd | 81 ab | 70.3 b |
| June 9 | 62 b | 68 bc | 70 cd | 82 a | 70.2 b |
| June 27 | 60 c | 65 d | 67 e | 75 d | 66.6 c |
| July 5 | 61 bc | 67 c | 69 d | 71 e | 66.9 c |
| July 11 | 61 bc | 64 d | 66 e | 74 d | 66.1 c |
| Hybrid Mean | 61.8 | 66.9 | 69.6 | 78 | 69.1 |
| LSD .05 | 1.5 | 1.5 | 1.5 | 1.5 | 0.9 |

* Means in the same column followed by the same letter are not significantly different at the 5% level.

Table 19. Plant height (cm) of 4 sunflower hybrids planted at 8 dates at Watertown, SD in 1994.

| Seeding Date | Hybrid | | | | Date Means |
|---|---|---|---|---|---|
| | Sunwheat 101 | Pioneer 6230 | Sigco 658 | Kaystar 9101 | |
| May 6 | 109 a | 151 ab | 156 a | 176 a | 148 a |
| May 12 | 106 a | 157 a | 149 a | 172 a | 146 ab |
| May 19 | 108 a | 155 ab | 150 a | 182 a | 149 a |
| May 31 | 105 a | 145 ab | 150 a | 180 a | 145 ab |
| June 9 | 108 a | 156 a | 153 a | 180 a | 149 a |
| June 27 | 105 a | 142 b | 152 a | 156 b | 139 b |
| July 5 | 101 ab | 129 bc | 143 ab | 152 b | 131 c |
| July 11 | 91 b | 122 c | 134 b | 149 b | 124 c |
| Hybrid Mean | 104 | 145 | 148 | 168 | 141 |
| LSD .05 | 14 | 14 | 14 | 14 | 7 |

* Means in the same column followed by the same letter are not significantly different at the 5% level.

Table 20. Lodging (%) of 4 sunflower hybrids planted at 8 dates at Watertown, SD in 1994.

| Seeding Date | Hybrid | | | | Date Means |
|---|---|---|---|---|---|
| | Sunwheat 101 | Pioneer 6230 | Sigco 658 | Kaystar 9101 | |
| May 6 | 6 | 18 | 6 | 11 | 10 |
| May 12 | 2 | 18 | 4 | 6 | 8 |
| May 19 | 4 | 3 | 16 | 11 | 8 |
| May 31 | 5 | 7 | 4 | 10 | 7 |
| June 9 | 5 | 6 | 7 | 8 | 7 |
| June 27 | 3 | 12 | 4 | 5 | 6 |
| July 5 | 2 | 12 | 8 | 5 | 7 |
| July 11 | 2 | 7 | 0 | 6 | 4 |
| Hybrid Mean | 4 | 10 | 6 | 8 | 7 |
| LSD .05 | ns | ns | ns | ns | ns |

Table 21. Head rot (%) of 4 sunflower hybrids planted at 8 dates at Watertown, SD in 1994.

| Seeding Date | Hybrid | | | | Date Means |
|---|---|---|---|---|---|
| | Sunwheat 101 | Pioneer 6230 | Sigco 658 | Kaystar 9101 | |
| May 6 | 4.2 a | 12.7 a | 9.4 a | 3.5 a | 7.4 a |
| May 12 | 2.8 ab | 9.8 a | 6.0 b | 1.0 ab | 4.9 b |
| May 19 | 1.0 b | 1.0 b | 1.5 c | 1.0 ab | 1.1 c |
| May 31 | 0.0 b | 2.1 b | 1.5 c | 0.0 b | 0.8 c |
| June 9 | 2.1 ab | 0.0 b | 0.3 c | 1.6 ab | 1.0 c |
| June 27 | 0.5 b | 0.6 b | 1.4 c | 0.0 b | 0.6 c |
| July 5 | 1.0 b | 0.5 b | 0.0 c | 0.0 b | 0.4 c |
| July 11 | 0.4 b | 0.0 b | 0.0 c | 0.0 b | 0.1 c |
| Hybrid Mean | 1.5 | 3.3 | 2.5 | 0.9 | 2.0 |
| LSD .05 | 3.1 | 3.1 | 3.1 | 3.1 | 1.9 |

* Means in the same column followed by the same letter are not significantly different at the 5% level.

Table 22. Oil content (%) of 4 sunflower hybrids planted at 8 dates at Watertown, SD in 1994.

| Seeding Date | Hybrid | | | | Date Means |
|---|---|---|---|---|---|
| | Sunwheat 101 | Pioneer 6230 | Sigco 658 | Kayatar 9101 | |
| May 6 | 37.5 a | 43.4 ab | 49.1 a | 39.9 a | 42.5 a |
| May 12 | 37.5 a | 44.5 a | 49.6 a | 39.1 a | 42.7 a |
| May 19 | 37.4 a | 44.8 a | 47.1 ab | 39.5 a | 42.2 a |
| May 31 | 36.7 a | 40.8 bc | 45.6 bc | 38.6 a | 40.4 b |
| June 9 | 36.2 a | 41.5 bc | 41.0 d | 39.4 a | 39.5 b |
| June 27 | 37.5 a | 39.7 c | 43.7 c | 35.9 b | 39.2 b |
| July 5 | 35.1 ab | 36.8 d | 37.6 e | 29.4 c | 34.7 c |
| July 11 | 32.5 b | 34.7 d | 35.1 e | 25.3 d | 31.9 d |
| Hybrid Mean | 36.3 | 40.8 | 43.6 | 36 | 39.1 |
| LSD .05 | 2.7 | 2.7 | 2.7 | 2.7 | 1.7 |

* Means in the same column followed by the same letter are not significantly different at the 5% level.

# SOYBEAN BREEDING

Roy A. Scott and Steve Stein

The soybean breeding program is aimed at developing soybean cultivars in maturity groups 0, I, and II. Several different locations across the state are used for testing lines each year. In addition to cultivar development, research is done at these locations to generate supporting data for the breeding program. Lines that are in at least their second year of yield testing are called advanced lines. These are lines that have shown good yield potential, but still need to continue performing well for several more years. Most of them will not make it as cultivars, but at this point they have the potential. These are the lines that will be the center of the discussion in this report.

Table 23 gives a summary of the performance of advanced lines at different locations across the state. Normally, at Watertown we test maturity groups 0 and I in separate experiments. Becsuse of the early frost in 1993, we were not able to separate lines into different maturity groups for 1994 testing. Consequently, maturity groups 0 through II lines were tested in the same experiments. Checks were included to cover MG0, MGI, and MGII.

Overall yields ranged from 30 bu/a at Dakota lakes non-irrigated test to 50 bu/a at Watertown. At Watertown, overall yields were significantly greater than all other locations in both tests (Table 23). Overall mean yields at Watertown were 10 and 4 bu/a, respectively in Test 1 and 2, greater than the combined mean across all test locations. In Test 1, the top experimentals at Watertown were 1.9 to 22.3 bu/a higher yielding than at other locations. In Test 2, yields of the top experimentals were 0.3 to 18.7 bushels greater than other locations. Yields of the top experimentals were greater than group 0 checks and Sturdy, but less than Parker and Kenwood.

In Test 1 at Watertown, Sturdy was lower yielding than maturity group 0 and I checks. Kenwood was higher yielding than group 0 checks, and had similar yields to group I check. In Test 2, group 0 checks were lower yielding than group I and II. Parker was higher yielding than Sturdy, and Kenwood was higher yielding than Parker. Typically, group II cultivars are too late for Watertown, and would be affected by the first frost. In 1994 group II cultivars were able to mature before the first frost, and that accounted for the higher yields of Kenwood. Overall, Hendricks was 2.5 and 6.5 bu/a higher yielding than Lambert in Test 1 and 2, respectively (Table 23). Test CV's ranged from 7.0 to 12.2. This indicated fairly reliable data overall, and most experiments were considered good.

## SUMMARY

Watertown was planted on 11 May, 1994. We had good moisture at planting time, and throughout the growing season. Temperatures were cooler than other locations, but were optimum throughout the growing season, and all lines were mature long before the first frost. Maturity group 0 and I soybean continue to do well in this environment. Although later maturing soybean generally outyielded earlier, in typical years later cultivers will suffer yield loss from frost damage.

Table 23. Yield summary of advanced soybean lines tested in five South Dakota environments in 1994.

| LOCATION[a] | MEAN YIELD (bu/a) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | OVERALL[c] | TOP 10% | CHECKS[b] | | | | | |
| | | | HKS | LBT | PKR | STY | KW D | CV[d] |
| **Test 1** | | | | | | | | |
| WATERTOWN | 50.2a | 56.30 | 54.1 | 51.6 | 61.2 | 50.5 | 59.7 | 8.1 |
| BERESFORD | 47.1b | 54.40 | 51.3 | 52.6 | 53.8 | 48.7 | 52.6 | 11.4 |
| BROOKINGS | 43.2c | 48.40 | 40.9 | 39.1 | 46.8 | 50.4 | 52.4 | 7.00 |
| D. LAKES-I. | 40.0d | 54.70 | 32.7 | 32.8 | 30.8 | 38.7 | 52.5 | 11.5 |
| D. LAKES-NI | 30.00 | 34.00 | 28.4 | 29.3 | 31.6 | 34.1 | 27.2 | 8.50 |
| COMBINED | 42.20 | 46.90 | 42.2 | 41.9 | 45.8 | 44.5 | 48.3 | 9.90 |
| **Test 2** | | | | | | | | |
| WATERTOWN | 46.7a | 54.70 | 49.3 | 42.8 | 55.2 | 60.6 | 56.5 | 10.9 |
| BROOKINGS | 45.1b | 54.40 | 43.5 | 41.0 | 48.5 | 52.0 | 57.0 | 12.2 |
| BERESFORD | 44.6b | 52.00 | 43.0 | 41.2 | 50.5 | 43.6 | 56.8 | 11.3 |
| D. LAKES-NI | 30.7c | 36.00 | 32.1 | 29.7 | 34.3 | 34.3 | 35.7 | 11.2 |
| COMBINED | 42.60 | 47.20 | 42.9 | 39.3 | 48.3 | 45.7 | 52.5 | 12.0 |

[a]D. Lakes-I = Dakota Lakes irrigated; D. Lakes-NI = Dakota Lakes non-irrigated.

[b]HKS = Hendricks (MG0); LBT = Lambert (MG0); PKR = Parker (MGI); STY = Sturdy (MGII);

[c]Locations with the same letter are not significantly different at 0.05 probability level.

[d]CV indicates precision of test. Smaller CV's indicate more reliable information.

# 1994 Soybean Fungicide Seed Treatment Trial

D. Gallenberg, R. Scott, M. Thompson and S. Stein

INTRODUCTION: Poor seed quality can significantly reduce soybean stand establishment. Problems in emergence and early season growth can further be compounded by seed and seedling diseases. The purpose of the following study was to determine the effects of various fungicide seed treatments on 2 soybean seed lots differing in quality on stand count and yield.

MATERIALS AND METHODS: Trials were conducted at both the Northeast Research Farm and Southeast Research Farm during 1994. The seed sources, fungicide seed treatments and number of plots were the same at both locations.

The variety Lambert was used in this study. Seed harvested in 1993 was designated "good seed", while seed harvested in 1992 was designated "poor seed". Plots were planted on 5/11/94 at the Northeast Farm and on 5/04/94 at the Southeast Farm. Plots were 4 rows wide (30" row width) and 20 ft long. Treatments were replicated 4 times.

Fungicide seed treatments (see Table 24) were applied prior to planting to both seed lots. Stand counts (plants/m) were taken in the center 2 rows on 06/03/94 at the Northeast Farm and on 06/01/94 at the Southeast Farm.

Plots were harvested at the end of the season. Yields (bu/A) and test weights (lb/bu) were calculated.

RESULTS AND DISCUSSION: Data are contained in Table 24. At the Northeast Farm, there were no significant differences among the fungicide seed treatments within a seed source for stand count. Differences between seed sources were also not significant except for the untreated seed where good seed exhibited a significantly higher stand count compared to poor seed. There were no significant differences between fungicide seed treatments or seed sources for yield or test weight.

At the Southeast Farm, there were no significant differences in stand counts between fungicide seed treatments. Two fungicide seed treatments (Vitavax 200 FL and Apron-Terraclor) had significantly higher stand counts with good seed compared to poor seed. There were no other differences in stand counts between the different seed sources. There were no significant differences between fungicide seed treatments or seed sources for yield or test weight.

These data indicate that while the seed source was significant in 1994, fungicide seed treatment had no effect within a seed source.

Table 24. 1994 SOYBEAN FUNGICIDE SEED TREATMENT TRIAL

| | Stand Count (plants/m) | | Yield (bu/A) | | Test Weight (lb/bu) | |
|---|---|---|---|---|---|---|
| NE FARM | GS[a] | PS | GS | PS | GS | PS |
| Untreated | 24.4 | 33.4 | 42.3 | 42.5 | 57.1 | 56.1 |
| Prevail | 24.3 | 28.5 | 42.4 | 43.2 | 56.4 | 55.8 |
| Vitavex 200 FL | 26.0 | 27.6 | 41.1 | 42.1 | 56.4 | 55.6 |
| Apron-Terraclor | 25.3 | 29.8 | 41.8 | 41.9 | 56.2 | 56.6 |
| Apron-Terraclor + Kodiak HB | 27.4 | 31.4 | 44.7 | 42.9 | 56.0 | 56.6 |
| LSD $_{(.05)}$ | 5.3 | | 4.9 | | 1.3 | |

| | Stand Count (plants/m) | | Yield (bu/A) | | Test Weight (lb/bu) | |
|---|---|---|---|---|---|---|
| SE FARM | GS | PS | GS | PS | GS | PS |
| Untreated | 24.1 | 29.5 | 34.5 | 36.5 | 55.5 | 55.8 |
| Prevail | 23.6 | 27.1 | 36.2 | 36.6 | 56.3 | 55.7 |
| Vitavex 200 FL | 23.4 | 30.8 | 37.3 | 40.0 | 54.9 | 55.3 |
| Apron-Terraclor | 21.3 | 30.6 | 35.5 | 38.0 | 55.1 | 55.8 |
| Apron-Terraclor + Kodiak HB | 24.8 | 38.4 | 35.3 | 34.1 | 56.6 | 55.4 |
| LSD $_{(.05)}$ | 5.7 | | 4.9 | | 1.6 | |

[a] GS = good seed, PS = poor seed.

# 1994 Spring Wheat Foliar Fungicide Trial

D. Gellenberg, J. Rudd, M. Thompson and B. Ferber

INTRODUCTION: Spring wheat ia subject to attack from a variety of foliar diseases. Some of these diseases can be controlled or reduced through application of foliar fungicides. The purpose of the following study was to determine the effects of various foliar fungicide treatments on foliar disease ratings, yield, and test weight of spring wheat.

MATERIALS AND METHODS: Trials were conducted at the Northeast Research Farm, Brookings Agronomy Farm, Brentford, and Selby during 1994. Varieties used at the various sites included Sharp, Prospect and XW398A4. The foliar fungicide treatments used at each site were replicated 4 times.

Fungicides used in this study include Tilt (propiconizole) and Dithane DF (mancozeb) as well as experimental compounds from Rohm and Haas (RH-7952) and Miles (Folicur). Tilt was applied aa a single application of 4 fl oz/A at flag leaf emergence (6/14/94 at Northeast Farm, 6/3/94 at Brentford and Selby and 6/15/94 at Brookings).

Three different schedules for mancozeb applications were used at the various sites. Mancozeb I: 1 lb/A before jointing (5/26/94 at Brentford, 5/24/94 at Selby and 6/7/94 at Brookings); Mancozeb II: 2 lb/A at boot (6/24/94 at Northeast Farm, 6/9/94 at Brentford, 6/6/94 at Selby and 6/24/94 at Brookings) and again 10 days later; and Mancozeb III: 1 lb/A before jointing and 2 lb/A at boot and again 10 days later.

RH-7952 and Folicur were each applied at two different schedules. RH-7952 I: 1.33 oz/A before jointing and RH-7952 II: 1.33 oz/A at boot and again 10 days later. Folicur I: 4 fl oz/A before jointing and Folicur II: 4 fl oz/A at boot.

Plots were rated for percent disease on the flag leaf and given an overall plot rating (0-5 scale) on 7/27/94 at Northeast Farm, 7/15/94 at Brentford, 7/8/94 at Selby, and 7/20/94 at Brookings. On 7/28/94 the Brookings plots were also rated for scab (0-5 scale) and these data converted to overall percent scab. Plots were harvested at the end of the season. Yields (bu/A) and test weights (lb/bu) were calculated.

RESULTS AND DISCUSSION: Data from the Northeast Farm are contained in Table 25. These treatments were part of the Scab Foliar Fungicide Trial planted on corn stubble, but contain only those treatments which normally would have been evaluated for leaf spot/rust control. In the variety Sharp each of the fungicide treatments resulted in lower disease ratings for either the overall plot rating and/or percent flag leaf infected. Mancozeb and Folicur gave significant increases in yield while these two fungicides end RH-7952 gave a significant increase in test weight.

In the variety Prospect, none of the fungicide treatments resulted in lower disease ratings. Mancozeb, RH-7952 and Folicur significantly increased yield, while RH-7952 significantly increased test weight.

In the line XW398A4, none of the fungicide treatments reduced the disease ratings. Mancozeb increased yield while Tilt increased test weight.

The data from Brentford and Selby are contained in Table 26. At Brentford, fungicides had little effect on disease ratings and did not significantly increase yield or test weight. At Selby, fungicides had no effect on disease ratings. Mancozeb II and III increased yield of Sharp. There were no effects of fungicides on test weights. Data from Brookings are contained in Table 27. There was very little effect of fungicides on leaf spot or scab ratings. Mancozeb III and RH-7952 I increased yield. There were no effects of fungicides on test weight.

Table 25. 1994 NE FARM SPRING WHEAT FOLIAR FUNGICIDE TRIAL.

| | Disease Ratings | | | |
|---|---|---|---|---|
| | Overall Plot | % Flag Inf. | Yield (bu/A) | TW (lb/bu) |
| **SHARP** | | | | |
| Untreated | 3.8 | 45.9 | 36.3 | 47.1 |
| Tilt | 3.3 | 25.3 | 39.3 | 49.5 |
| Mancozeb II | 3.5 | 34.5 | 39.5 | 51.4 |
| RH-7952 II | 2.8 | 25.6 | 37.9 | 51.0 |
| Folicur II | 3.0 | 24.2 | 40.2 | 52.0 |
| LSD $_{(.05)}$ | 0.8 | 14.1 | 3.2 | 2.8 |
| **PROSPECT** | | | | |
| Untreated | 2.3 | 23.4 | 26.7 | 42.7 |
| Tilt | 2.5 | 31.3 | 27.6 | 43.7 |
| Mancozeb II | 1.8 | 17.5 | 32.8 | 44.8 |
| RH-7952 II | 1.8 | 16.6 | 31.1 | 45.4 |
| Folicur II | 1.5 | 16.4 | 32.4 | 43.9 |
| LSD $_{(.05)}$ | 0.9 | 15.3 | 3.9 | 2.6 |
| **XW398A4** | | | | |
| Untreated | 3.0 | 31.1 | 19.6 | 38.1 |
| Tilt | 3.5 | 36.4 | 20.3 | 40.5 |
| Mancozeb II | 2.5 | 16.9 | 23.3 | 39.4 |
| RH-7952 II | 2.8 | 22.6 | 23.0 | 39.2 |
| Folicur II | 3.3 | 22.8 | 22.0 | 39.0 |
| LSD $_{(.05)}$ | 0.7 | 18.3 | 3.3 | 1.9 |

Table 26. 1994 SPRING WHEAT FOLIAR FUNGICIDE TRIAL: SELBY & BRENTFORD

| | Disease Ratings | | | | Yield (bu/A) | | TW (lb/bu) | |
|---|---|---|---|---|---|---|---|---|
| | Overall Plot | | % Flag Inf. | | | | | |
| | Pros. | Sharp | Pros. | Sharp | Pros. | Sharp | Pros. | Sharp |
| **BRENTFORD** | | | | | | | | |
| Untreated | 2.0 | 3.3 | 24.3 | 52.0 | 33.9 | 35.2 | 56.3 | 57.8 |
| Tilt | 3.1 | N/A | 60.0 | N/A | N/A | 31.9 | N/A | 58.1 |
| Mancozeb I | 3.0 | N/A | 40.5 | N/A | N/A | 32.5 | N/A | 58.1 |
| Mancozeb II | 2.3 | N/A | 18.1 | N/A | N/A | 35.4 | N/A | 57.6 |
| Mancozeb III | 2.3 | N/A | 18.6 | N/A | N/A | 34.7 | N/A | 57.4 |
| RH-7952 I | N/A | 3.7 | N/A | 58.7 | 29.7 | N/A | 57.8 | N/A |
| Folicur I | N/A | 3.0 | N/A | 53.8 | 32.5 | N/A | 56.8 | N/A |
| Folicur II | N/A | 2.7 | N/A | 40.2 | 35.1 | N/A | 57.0 | N/A |
| LSD (.05) | 0.8 | | 22.2 | | 66.4 | | 2.3 | |
| **SELBY** | | | | | | | | |
| Untreated | 3.8 | 3.0 | 15.3 | 14.8 | 54.1 | 54.4 | 59.8 | 57.9 |
| Tilt | 3.8 | N/A | 15.9 | N/A | N/A | 56.3 | N/A | 58.4 |
| Mancozeb I | 3.8 | N/A | 13.4 | N/A | N/A | 54.6 | N/A | 58.6 |
| Mancozeb II | 3.0 | N/A | 8.4 | N/A | N/A | 59.5 | N/A | 59.7 |
| Mancozeb III | 3.0 | N/A | 8.8 | N/A | N/A | 58.3 | N/A | 59.1 |
| RH-7952 I | N/A | 3.3 | N/A | 14.8 | 52.7 | N/A | 59.0 | N/A |
| RH-7952 II | N/A | 2.5 | N/A | 10.0 | 55.1 | N/A | 60.2 | N/A |
| Folicur I | N/A | 3.3 | N/A | 9.8 | 53.1 | N/A | 58.6 | N/A |
| Folicur II | N/A | 2.3 | N/A | 7.0 | 52.6 | N/A | 59.5 | N/A |
| LSD (.05) | 0.8 | | 5.7 | | 2.0 | | 1.9 | |

Table 27. 1994 SPRING WHEAT FOLIAR FUNGICIDE TRIAL: BROOKINGS

| | Field Ratings | | Disease Ratings | | | |
|---|---|---|---|---|---|---|
| | | | Overall | | | |
| **PROSPECT** | Plot | % Scab | Plot | % Flag Inf. | Yield | TW |
| Untreated | 1.6 | 22.4 | 3.5 | 15.3 | 24.2 | 55.5 |
| Tilt | 1.5 | 21.0 | 3.3 | 14.3 | 26.7 | 55.3 |
| Mancozeb I | 1.4 | 16.5 | 3.5 | 15.0 | 26.6 | 55.2 |
| Mancozeb II | 1.4 | 17.7 | 3.0 | 10.1 | 25.6 | 55.3 |
| Mancozeb III | 1.7 | 24.8 | 3.0 | 10.1 | 27.1 | 55.2 |
| RH-7952 I | 1.2 | 12.6 | 3.5 | 12.8 | 27.1 | 56.1 |
| RH-7952 II | 1.4 | 16.4 | 3.0 | 12.5 | 26.4 | 55.9 |
| Folicur I | 1.5 | 20.9 | 3.3 | 12.8 | 25.4 | 54.9 |
| Folicur II | 1.5 | 19.7 | 3.0 | 10.6 | 26.8 | 55.9 |
| LSD (.05) | 0.3 | 7.9 | 0.6 | 4.3 | 2.7 | 1.6 |

# 1994 Oats Foliar Fungicide Trial

D. Gallenberg, D. Reeves, M. Thompson and L. Hall

INTRODUCTION: Oats are subject to attack from a variety of foliar diseases. Some of these diseases can be controlled or reduced through application of foliar fungicides. The purpose of the following study was to determine the effects of various foliar fungicide treatments on foliar disease ratings, yield and test weight of oats.

MATERIALS AND METHODS: Trials were conducted at the Northeast Research Farm, Brookings Agronomy Farm and Southeast Research Farm during 1994. The variety Don was used in this study. The foliar fungicide treatments and number of plots were the same at all 3 locations. Treatments were replicated 4 times.

Fungicides used in the study were Tilt (propiconazole) and Dithane DF (mancozeb). Tilt is not currently labelled on oats and was applied as an experimental compound in a single application of 4 fl oz/A at flag leaf emergence (6/9/94 at Northeast Farm, 6/3/94 at Brookings, 6/1/94 at Southeast Farm). Three mancozeb treatments were used: Mancozeb I: 1 lb/A before jointing (6/3/94 at Northeast Farm, 6/2/94 et Brookings, 5/19/94 at Southeast Farm); Mancozeb II: 2 lb/A at boot (6/14/94 at Northeast Farm, 6/14/94 at Brookings, 6/10/94 at Southeast Farm) and again 10 days later; and Mancozeb III: 1 lb/A before jointing, 2 lb/A at boot and again 10 days later.

Plots were rated for % disease on the flag leaf (i.e. % non-green tissue) and given an overall plot rating (0-5 scale) on 7/12/94 at Northeast Farm and Brookings and on 7/5/94 at Southeast Farm.

Plots were harvested at the end of the season. Yields (bu/A) and test weights (lb/bu) were calculated.

RESULTS AND DISCUSSION: Data are contained in Table 28. At all 3 locations, all fungicide treatments significantly reduced the disease ratings and increased yield compared to the untreated check. All fungicide treatments significantly increased test weight at both Southeast Farm and Brookings.

Two mancozeb treatments (Mancozeb II and III) consistently gave greater numerical reductions in disease rating and increases in yield and test weight.

Several diseases including crown rust were present at all 3 locations, particularly late in the season. These data from 1994 indicate that consistent decreases in disease and increases in yield and test weight in oats can be achieved with applications of foliar fungicides.

Table 28. 1994 OATS FOLIAR FUNGICIDE TRIAL

| | Disease Rating | | | |
|---|---|---|---|---|
| | % Flag Leaf Infected | Plot Rating Scale 0-5 | Yield (bu/A) | Test Weight (lb/bu) |
| **NE FARM** | | | | |
| Untreated | 58.6 | 3.8 | 78.3 | 33.8 |
| Tilt | 25.0 | 2.8 | 89.5 | 34.0 |
| Mancozeb I | 30.4 | 3.0 | 89.6 | 34.6 |
| Mancozeb II | 12.0 | 2.0 | 96.6 | 33.8 |
| Mancozeb III | 6.2 | 1.5 | 102.1 | 33.1 |
| LSD $_{(.05)}$ | 14.2 | 0.5 | 6.7 | 1.2 |
| **BROOKINGS** | | | | |
| Untreated | 92.5 | 4.3 | 83.1 | 31.1 |
| Tilt | 46.9 | 3.3 | 104.4 | 33.7 |
| Mancozeb I | 42.8 | 3.0 | 104.4 | 34.3 |
| Mancozeb II | 7.8 | 2.0 | 106.6 | 34.2 |
| Mancozeb III | 6.5 | 1.3 | 110.1 | 34.9 |
| LSD $_{(.05)}$ | 11.4 | 0.6 | 5.0 | 0.9 |
| **SE FARM** | | | | |
| Untreated | 96.9 | 5.0 | 64.1 | 31.2 |
| Tilt | 57.5 | 3.3 | 78.2 | 32.6 |
| Mancozeb I | 78.8 | 3.5 | 72.8 | 32.2 |
| Mancozeb II | 5.2 | 1.0 | 80.8 | 33.2 |
| Mancozeb III | 4.4 | 1.0 | 82.1 | 33.2 |
| LSD $_{(.05)}$ | 8.1 | 0.5 | 4.2 | 0.9 |

# 1994 Barley Foliar Fungicide Trial

D. Gallenberg, D. Reeves, M. Thompson and L. Hall

INTRODUCTION: Barley is subject to attack from a variety of foliar diseases. Some of these diseases can be controlled or reduced through application of foliar fungicides. The purpose of the following study was to determine the effects of various foliar fungicide treatments on foliar disease ratings, yield and test weight of barley.

MATERIALS AND METHODS: Trials were conducted at the Northeast Research Farm and Brookings Agronomy Farm during 1994. The variety Robust was used in this study. The foliar fungicide treatments and number of plots were the same at both locations. Treatments were replicated 4 times.

Fungicides used in the study were Tilt (propiconazole) and Dithane DF (mancozeb). Tilt is not currently labelled on barley and was applied as an experimental compound in a single application of 4 fl oz/A at flag leaf emergence (6/9/94 at Northeast Farm and 6/6/94 at Brookings). Three mancozeb treatments were used: Mancozeb I: 1 lb/A before jointing (6/3/94 at Northeast Farm and 6/2/94 at Brookings); Mancozeb II: 2 lb/A at boot (6/14/94 at both locations) and again 10 days later; and Mancozeb III: 1 lb/A before jointing 2 lb/A at boot and again 10 days later.

Plots were rated for % disease on the flag leaf (i.e. % non-green tissue) and given an overall plot rating (0-5 scale) on 7/19/94 at Northeast Farm and on 7/15/94 at Brookings.

Plots were harvested at the end of the season. Yields (bu/A) and test weights (lb/bu) were calculated.

RESULTS AND DISCUSSION: Data are contained in Table 29. There were no significant differencea in disease ratings, yield or test weight at either location for any of the fungicide treatments. Some disease pressure was present at both sites but these data from 1994 indicate that foliar fungicides had no effect.

Table 29. 1994 BARLEY FOLIAR FUNGICIDE TRIAL

| | Disease Rating | | | |
|---|---|---|---|---|
| | % Flag Leaf Infected | Plot Rating Scale 0-5 | Yield (bu/A) | Test Weight (lb/bu) |
| **NE FARM** | | | | |
| Untreated | 28.1 | 2.3 | 61.6 | 43.0 |
| Tilt | 19.6 | 2.8 | 61.5 | 44.0 |
| Mancozeb I | 31.7 | 2.3 | 58.7 | 43.9 |
| Mancozeb II | 22.8 | 2.5 | 59.4 | 44.2 |
| Mancozeb III | 28.7 | 3.0 | 57.9 | 44.0 |
| LSD $_{(.05)}$ | 17.7 | 0.9 | 6.1 | 1.4 |
| **BROOKINGS** | | | | |
| Untreated | 92.5 | 3.0 | 63.6 | 49.4 |
| Tilt | 84.4 | 3.0 | 63.6 | 49.8 |
| Mancozeb I | 71.3 | 3.0 | 63.5 | 49.4 |
| Mancozeb II | 76.9 | 3.3 | 65.8 | 49.9 |
| Mancozeb III | 81.9 | 3.0 | 65.6 | 49.6 |
| LSD $_{(.05)}$ | 19.0 | 0.9 | 5.0 | 0.9 |

# 1994 Spring Wheat Scab Foliar Fungicide Trial

D. Gellenberg, J. Rudd, M. Thompson and B. Ferber

INTRODUCTION: Scab is a serious disease of wheat, barley and other small grains. Severity reached epidemic proportions in perts of South Dakota and the Upper Great Plains in 1993. Thia disease ia very dependent on weather conditions, with wet, humid weather being more favorable for disease. Rotations, tillage practices end, to some extent, varieties are important in control of scab.

Typically, foliar fungicides have not been recommended for acab control. However, there ia continuing interest in the evaluation of foliar fungicides as an aid in reducing scab. The purpose of the following atudy was to evaluate the performance of selected labelled and experimental fungicides applied in various schedules for control of scab.

MATERIALS AND METHODS: Spring wheat plots at the Northeast Research Farm were planted into 1993 corn residue to enhance the potential for scab development. Two varieties, Sharp and Prospect, as well as an unreleased line, XW398A4, were used in the study because they represented a range of scab susceptibility and maturity (i.e. Sharp - most resistant/earliest, XW398A4 - most susceptible/latest) according to previous ratings. Blocks of 40 plots of each were used and 10 fungicide treatments replicated 4 times each within each block.

Four different fungicides were used in the study. Tilt and Dithane DF (mancozeb) are currently labelled on wheat while Folicur and RH-7952 are experimental compounds from Miles and Rohm and Haas, respectively. Tilt was applied as a single application of 4 fl oz/A at flag leaf emergence.

Four different schedules for mancozeb application were used: Mancozeb II: 2 lb/A at boot and again 10 days later; Mancozeb IV: 2 lb/A at boot and again 10 and 20 days later; Mancozeb V: 2 lb/A at anthesis (flowering) and again 5 and 10 days later; and Mancozeb VI: 2 lb/A at anthesis and again 7 days later.

RH-7952 and Folicur were each applied at 2 different schedules: RH-7952 II: 1.33 oz/A at boot and again 10 days later; RH-7952 III: 1.33 oz/A at boot and again 10 and 20 days later; Folicur II: 4 fl oz/A at boot; and Folicur III: 4 fl oz/A at anthesis.

Although there was some difference in maturity of the 3 varieties, a single application date was used for each stage. The flag leaf application was made on 6/14/94, the boot application on 6/24/94, and the anthesis application on 7/4/94. The applications for boot+10, boot+20, anthesis+5, anthesis+7 and anthesis+10 followed accordingly.

Plots were visually rated for head scab on 7/28/94. These data were converted to percent total scab. Yields and test weight were calculated after harvest. Samples of 100 kernels from each plot were evaluated for percent visual scabby kernels and plated on acidified PDA. Counts for percent of kernels resulting in Fusarium-type growth were taken at 3 and 5 days after plating.

RESULTS AND DISCUSSION: Data are summarized in Table 30. With respect to disease ratings in the field, foliar fungicide applications had essentially no effect except in the most susceptible line (XW398A4) where several treatments resulted in a slight reduction.

Similarly there was basically no effect of fungicide treatment on percent visual scabby kernels after harvest. However, a number of fungicide treatments resulted in significantly higher percent Fusarium infection in Sharp and Prospect. This can probably be explained by assuming that many light, severely infected kernels in the more scabby treatments (i.e. untreated) would have been blown out the combine during harvest and thus result in a lower proportion of scabby seed.

When compared to untreated, each of the fungicide treatments resulted in an incrsase in yield and/or test weight for at least one of the varieties. Three treatments (Mancozeb IV, RH-7952 III and Folicur III) resulted in significant increases in both yield and test weight in all three varieties.

These results indicate that significant increases in yield and test weight can be achieved with foliar fungicide applications. Some of these treatments may be economically viable, particularly on more resistant varieties.

Table 30. 1994 SPRING WHEAT SCAB FOLIAR FUNGICIDE TRIAL

| | Post Harvest | | | | | |
|---|---|---|---|---|---|---|
| | Field Ratings | | % Visual | % Fusarium Infection | Yield | TW |
| SHARP | Plot | % Scab | Scab | (3 d / 5 d)* | (Bu/A) | (lbs/bu) |
| Untreated | 1.3 | 21.3 | 13.3 | 4.5 / 38.8 | 36.3 | 47.1 |
| Tilt | 1.1 | 15.9 | 15.5 | 5.8 / 44.5 | 39.3 | 49.5 |
| Mancozeb II | 1.3 | 20.1 | 12.0 | 4.8 / 48.3 | 39.5 | 51.4 |
| Mancozeb IV | 1.1 | 16.3 | 11.5 | 10.0 / 50.8 | 41.2 | 53.0 |
| Mancozeb V | 1.3 | 20.1 | 14.3 | 7.8 / 51.0 | 41.5 | 52.5 |
| Mancozeb VI | 1.2 | 18.6 | 14.8 | 8.8 / 47.5 | 39.7 | 50.7 |
| RH-7952 II | 1.4 | 22.6 | 16.0 | 6.3 / 51.8 | 37.9 | 51.0 |
| RH-7952 III | 1.4 | 22.3 | 11.5 | 8.0 / 41.3 | 42.9 | 52.6 |
| Folicur I | 1.4 | 23.9 | 9.3 | 5.8 / 44.8 | 40.2 | 52.0 |
| Folicur III | 1.4 | 21.8 | 9.0 | 9.0 / 39.0 | 42.2 | 52.4 |
| LSD $_{(.05)}$ | 0.3 | 7.3 | 4.9 | 5.6 / 9.4 | 3.2 | 2.8 |
| PROSPECT | | | | | | |
| Untreated | 1.1 | 16.4 | 23.8 | 4.5 / 39.8 | 26.7 | 42.7 |
| Tilt | 1.3 | 20.5 | 19.8 | 12.8 / 54.5 | 27.6 | 43.7 |
| Mancozeb II | 1.1 | 17.9 | 22.5 | 12.3 / 54.3 | 32.8 | 44.8 |
| Mancozeb IV | 1.4 | 21.9 | 21.0 | 8.3 / 49.3 | 30.1 | 44.2 |
| Mancozeb V | 1.2 | 18.3 | 18.5 | 16.8 / 51.5 | 31.2 | 45.6 |
| Mancozeb VI | 1.2 | 19.0 | 18.8 | 12.8 / 50.0 | 32.0 | 45.6 |
| RH-7952 II | 1.1 | 16.0 | 22.3 | 13.8 / 52.3 | 31.1 | 45.4 |
| RH-7952 III | 1.1 | 15.1 | 18.5 | 14.8 / 49.5 | 31.6 | 45.6 |
| Folicur II | 1.1 | 16.0 | 17.0 | 8.8 / 44.8 | 32.4 | 43.9 |
| Folicur III | 1.2 | 18.6 | 20.0 | 14.5 / 45.3 | 32.1 | 45.3 |
| LSD $_{(.05)}$ | 0.2 | 5.3 | 5.7 | 6.8 / 10.4 | 3.9 | 2.6 |
| XW398A4 | | | | | | |
| Untreated | 2.2 | 40.9 | 31.5 | 8.8 / 42.8 | 19.6 | 38.1 |
| Tilt | 2.0 | 36.8 | 31.3 | 12.5 / 53.3 | 20.3 | 40.5 |
| Mancozeb II | 1.8 | 32.9 | 32.3 | 8.5 / 53.0 | 23.3 | 39.4 |
| Mancozeb IV | 1.8 | 33.0 | 32.8 | 16.5 / 44.5 | 23.5 | 40.2 |
| Mancozeb V | 2.0 | 37.3 | 37.0 | 12.5 / 40.3 | 23.0 | 41.7 |
| Mancozeb VI | 1.6 | 27.6 | 32.3 | 8.8 / 40.5 | 22.5 | 40.8 |
| RH-7952 II | 1.8 | 30.6 | 32.0 | 12.0 / 48.3 | 23.0 | 39.2 |
| RH-7952 III | 2.1 | 40.3 | 35.5 | 9.8 / 48.8 | 23.8 | 40.6 |
| Folicur II | 2.0 | 36.1 | 37.3 | 10.0 / 50.5 | 22.0 | 39.0 |
| Folicur III | 2.0 | 36.4 | 32.5 | 11.5 / 46.3 | 23.3 | 41.2 |
| LSD $_{(.05)}$ | 0.4 | 9.6 | 7.2 | 8.5 / 18.5 | 3.3 | 1.9 |

* 3 d - APDA plates read after 3 days; 5 d - after 5 days

# 1994 Spring Wheat Variety Scab Ratings: Advanced Yield Trial

D. Gallenberg, J. Rudd, M. Thompson and B. Ferber

INTRODUCTION: Scab is a serious disease of wheat, barley and other small grains. Severity reached epidemic proportions in parts of South Dakota and the Upper Great Plains in 1993. This disease is very dependent on weather conditions, with wet, humid weather being more favorable for disease.

Varieties represent an important strategy for present and future control of scab. The purpose of the following study was to rate several standard varieties and advanced lines for their reaction to scab.

MATERIALS AND METHODS: Plots evaluated in this study were part of the Spring Wheat Breeding Program Advanced Yield Trials. One set of spring wheat plots at the Northeast Research Farm was planted into 1993 corn residue to enhance the potential for scab development. The standard AYT plots were planted into 1993 soybean residue. Both sets of plots (corn stubble and soybean stubble) were evaluated for scab.

Plots were visually rated for head scab on 7/28/94. These data were converted to percent total scab. Yields and test weight were calculated after harvest. Samples of 100 kernels from each plot were evaluated for percent visual scabby kernels and plated on acidified PDA. Counts for percent of kernels resulting in Fusarium-type growth were taken at 3 and 5 days after plating.

RESULTS AND DISCUSSION: Data are summarized in Table 31. The line XW398A4, which was included as a susceptible check, consistently had the highest amount of scab and lowest yield and test weight.

With respect to field ratings, Sharp, 2375, SD0007, SD0010, SD3151 and SD3156 were among the varieties that had the lowest overall plot and percent scab ratings for both the corn stubble and soybean stubble tests.

Sharp, 2375 and SD3151 had the lowest percent visual scabby kernels after harvest in both tests. SD3151 and SD3156 had the lowest percent Fusarium infection after 5 days in both tests.

SD0010 was the only variety in the top yielding group in both tests. Butte 86, Sharp, 2375, Kulm, SD8073, SD0010 and SD3151 had highest test weights in both tests.

Table 31. 1994 SPRING WHEAT VARIETY SCAB RATINGS: ADVANCED YIELD TRIAL

| CORN STUBBLE | Field Ratings Plot | Field Ratings % Scab | Post Harvest % Visual Scab | Post Harvest % Fusarium Infection (3 d / 5 d)* | Yield (Bu/A) | TW (lbs/bu) |
|---|---|---|---|---|---|---|
| Chris | 1.4 | 21.7 | N/A | N/A / N/A | 19.9 | 48.8 |
| Butte 86 | 1.5 | 23.7 | 9.7 | 4.7 / 42.7 | 34.9 | 53.3 |
| Prospect | 1.4 | 22.3 | 13.0 | 4.3 / 48.3 | 24.8 | 48.8 |
| Sharp | 1.1 | 16.5 | 8.0 | 5.3 / 21.3 | 35.6 | 54.7 |
| 2375 | 1.2 | 18.2 | 8.3 | 10.7 / 42.7 | 27.9 | 52.9 |
| Kulm | 1.4 | 22.8 | 8.3 | 3.7 / 32.0 | 35.0 | 56.6 |
| XW398A4 | 2.3 | 44.3 | 31.0 | 17.0 / 56.0 | 16.2 | 42.8 |
| SD8073 | 1.6 | 28.7 | 15.3 | 4.7 / 32.3 | 33.0 | 52.4 |
| SBE0437 | 1.2 | 19.2 | 16.0 | 9.7 / 40.0 | 28.3 | 49.8 |
| SD0007 | 1.1 | 15.2 | 17.0 | 16.7 / 43.7 | 30.6 | 50.9 |
| SD0010 | 1.3 | 19.5 | 19.3 | 11.0 / 31.7 | 33.2 | 54.0 |
| SD0014 | 1.3 | 19.7 | 12.0 | 14.7 / 48.3 | 24.6 | 48.7 |
| SD3151 | 1.2 | 18.5 | 3.7 | 2.7 / 30.3 | 33.9 | 54.7 |
| SD3156 | 1.4 | 24.2 | 10.3 | 7.0 / 29.0 | 30.0 | 51.0 |
| LSD $_{(.05)}$ | 0.4 | 8.0 | 5.7 | 7.9 / 12.3 | 4.2 | 2.7 |

| SOYBEAN STUBBLE | Field Ratings Plot | Field Ratings % Scab | Post Harvest % Visual Scab | Post Harvest % Fusarium Infection (3 d / 5 d)* | Yield (Bu/A) | TW (lbs/bu) |
|---|---|---|---|---|---|---|
| Chris | 1.8 | 32.2 | 12.0 | 34.7 / 65.0 | 20.8 | 48.7 |
| Butte 86 | 1.5 | 24.8 | 4.3 | 26.7 / 60.0 | 35.1 | 54.8 |
| Prospect | 1.9 | 33.7 | 7.7 | 33.7 / 61.0 | 29.5 | 50.8 |
| Sharp | 1.2 | 19.3 | 6.3 | 32.0 / 54.7 | 34.6 | 54.1 |
| 2375 | 1.2 | 20.5 | 7.0 | 31.7 / 58.0 | 35.1 | 55.0 |
| Kulm | 2.0 | 36.2 | 7.7 | 32.7 / 57.0 | 37.8 | 56.4 |
| XW398A4 | 2.4 | 46.8 | 26.7 | 65.7 / 88.3 | 23.6 | 44.3 |
| SD8073 | 1.6 | 28.8 | 10.3 | 31.0 / 56.3 | 38.1 | 55.4 |
| SBE0437 | 1.6 | 28.0 | 18.3 | 34.0 / 61.3 | 34.8 | 52.7 |
| SD0007 | 1.5 | 25.2 | 11.0 | 31.3 / 62.3 | 35.6 | 51.7 |
| SD0010 | 1.3 | 20.5 | 6.7 | 22.3 / 58.7 | 41.6 | 55.8 |
| SD0014 | 1.6 | 26.8 | 12.3 | 19.7 / 61.3 | 32.9 | 52.4 |
| SD3151 | 1.1 | 17.0 | 2.7 | 2.7 / 29.7 | 36.5 | 55.2 |
| SD3156 | 1.2 | 19.7 | 9.7 | 5.7 / 37.7 | 31.6 | 48.3 |
| LSD $_{(.05)}$ | 0.5 | 10.6 | 4.9 | 8.4 / 12.8 | 3.5 | 2.9 |

* 3 d - APOA plates read after 3 days; 5 d - after 5 days

## WEED CONTROL - W.E.E.D. PROJECT

L. J. Wrage, P. O. Johnson, D. A. Vos, and S. A. Wagner

Evaluation and extension demonstration plots provide weed control data for northeastern South Dakota. The W.E.E.D. program includes comparisons of labeled treatments for all major crops and experimental herbicides available for initial evaluation.

Demonstration plots provide side-by-side comparisons. Rates used are those best suited for the weed and soil type. Plots are evaluated for weed control and crop tolerance. Yields are harvested from replicated tests. Data collected are summarized over several years to provide a more accurate measurement of expected performance. These plots are used for tours and are the basis for educational material.

### 1994 TESTS

Several additional field tests were established for 1994. Weather conditions were favorable; early season weed control was excellent for many herbicides. No-till evaluations are reported for the first time; representing an expanded project effort for no-till. Data for tests listed below are reported in the following tables.

Table 32 - Corn Herbicide Demonstration
Table 33 - Soybean Herbicide Demonstration
Table 34 - Foxtail Control in Spring Wheat
Table 35 - Sunflower Herbicide Demonstration
Table 36 - Primary Herbicide Screen - Oats
Table 37 - No-Till Corn Weed Control
Table 38 - No-Till Soybean Herbicides

Fifteen Additional field evaluation and demonstration tests were conducted in 1994. These include initial evaluation of unlabeled, experimental herbicides, herbicide addatives, additional no-till comparisons and herbicide tests on millet, dry beans and potato. Data for these tests are reported in the W.E.E.D. project data report.

Experimental Tests and other Weed Control Evaluations

Broadleaf Weeds in Corn - Laddok Addatives
Broadleaf Weeds in Corn - Beacon tank-mixes
Experimental for Broadleaf Weeds in Corn
Broadleaf Weeds in Corn - Basagran tank-mixes
Postemerge Broadleaf Weeds in Corn - Sencor tank-mixes
No-Till Corn - Burndown Soil Herbicides
No-Till Corn - Reduced Herbicide Inputs
Kochia Control in Corn - PRE and POST
Broadleaf Weeds in Soybeans - Galaxy Addatives
Kochia Control in Soybeans - Pinnacle/Classic
No-Till Soybeans - Reduced Herbicide Input
Barley-Wheat Variety Screen - Express/Harmony Extra
Edible Bean Herbicide Evaluation
Proso Millet Herbicide Evaluation
Potato Herbicide Evaluation

The cooperation and assistance from station personnel is acknowledged. Extension agents identify needs, assist with tours, and utilize the data in producer programs.

**Data reported in this publication are results from field tests that include labeled product uses, experimental products or experimental rates, combinations or other unlabeled uses for herbicide products. Refer to the appropriate weed control fact sheet available from county extension offices for herbicide recommendations.**

Table 32. Corn Herbicide Demonstration

Demonstration
Planting Date: 5/10/94
PPI, SPPI, PRE: 5/10/94
EPOST: 5/26/94
POST: 6/6/94
Soil: Silty clay loam; 3.2% OM; 6.3 pH

Precipitation: 1st week: 0.93 inches
2nd week: 0.93 inches

Weeds: Grft = Green foxtail
BDLF = Broadleaves

COMMENTS: Uniform, moderate weed pressure. Excellent comparative differences. Rainfall was adequate; several preemergence treatments provided excellent control. Weed control for most treatments was higher in 1994 than for the 3-yr average. Eight treatments provided at least 90% control of both grasses and broadleaves. Eradicane treatments located on previous (2-yr) similar treatments. Postemerge treatments for broadleaf weeds were highly effective.

| Treatment | lb/A act. | % Grft 7/11 | %BDLF 7/11 | 3-Yr Ave Gr | 3-Yr Ave Bdlf |
|---|---|---|---|---|---|
| Check | ---- | 0 | 0 | 0 | 0 |
| **PREPLANT INCORPORATED** | | | | | |
| Eradicane | 4 | 38 | 28 | 63 | 46 |
| Pursuit | .063(4 oz) | 72 | 95 | -- | -- |
| Eradicane + Extrazine II | 3 + 2 | 81 | 88 | 84 | 88 |
| Eradicane + Surpass | 3.35 + .75 | 79 | 73 | -- | -- |
| **SHALLOW PREPLANT INCORPORATED** | | | | | |
| Dual II | 2.5 | 88 | 64 | 82 | 55 |
| Lasso | 3 | 82 | 67 | 79 | 61 |
| Frontier | 1.5(1.6 pt) | 87 | 75 | -- | -- |
| Harness Plus | 2(2.3 pt) | 88 | 84 | -- | -- |
| Surpass | 2(2.5 pt) | 89 | 86 | -- | -- |
| Broadstrike/Dual | 2.166(2.25 pt) | 88 | 93 | -- | -- |
| **SHALLOW PREPLANT INCORPORATED & POSTEMERGENCE** | | | | | |
| Bladex&Accent + COC + 28% N | 2&.0313(2/3 oz) + .75% + 4% | 93 | 98 | 87 | 93 |
| **PREEMERGENCE** | | | | | |
| Atrazine | 2 | 65 | 96 | 70 | 96 |
| Bladex | 3 | 57 | 82 | 64 | 81 |
| Dual II | 2.5 | 90 | 55 | 80 | 41 |
| Lasso | 3 | 92 | 66 | 84 | 52 |
| Prowl | 1.5 | 70 | 78 | 63 | 67 |
| Ramrod | 6 | 90 | 71 | 80 | 53 |
| Harness Plus | 2 | 96 | 89 | 89 | 71 |
| Surpass | 2 | 96 | 88 | 91 | 71 |
| Frontier | 1.5 | 89 | 85 | 84 | 59 |
| Extrazine II | 3 | 77 | 92 | -- | -- |
| Harness Plus + Battalion | 2 + .075 | 96 | 98 | 78 | 93 |
| Broadstrike/Dual | 2.166 | 85 | 94 | -- | -- |
| Lasso + Extrazine II | 2 + 2 | 86 | 92 | 75 | 75 |

Table 32. Continued. . .

| Treatment | lb/A act. | % Grft 7/11 | % BDLF 7/11 | 3 - Yr Ave Gr | 3 - Yr Ave Bdlf |
|---|---|---|---|---|---|
| PREEMERGENCE & POSTEMERGENCE | | | | | |
| Lasso + Marksman | 2 + 1 | 85 | 96 | -- | -- |
| Dual II + Marksman | 2 + 1 | 86 | 96 | -- | -- |
| Acetochlor + Marksman | 1.33 + 1 | 95 | 98 | -- | -- |
| Frontier + Marksman | 1 + 1 | 90 | 96 | -- | -- |
| EARLY POSTEMERGENCE | | | | | |
| Prowl + Marksman | 1.5 + 1.4 | 42 | 96 | -- | -- |
| Extrazine II + Prime Oil II | 2 + 1 qt | 55 | 95 | -- | -- |
| Frontier + Accent + Clarity + X-77 + 28% N | .94(1 pt) + .016(1/3 oz) + .4 + .25% + 4% | 79 | 96 | -- | -- |
| PREEMERGENCE & POSTEMERGENCE | | | | | |
| Ramrod&Tough + atrazine | 4&.47 + .6 | 94 | 99 | 89 | 92 |
| Ramrod&Clarity | 4&.5 | 87 | 96 | 79 | 94 |
| Ramrod&Banvel | 4&.25 | 85 | 93 | 77 | 76 |
| Ramrod&2.4-D amine | 4&.5 | 83 | 81 | 76 | 66 |
| Ramrod&Basagran + atrazine + COC | 4&.52 + .52 + 1 qt | 89 | 94 | 82 | 72 |
| Ramrod&Buctril | 4&.38 | 82 | 95 | -- | -- |
| Ramrod&Buctril + atrazine | 4&.25 + .5 | 88 | 97 | 80 | 76 |
| Ramrod&Marksman | 4 + 1 | 87 | 97 | 78 | 81 |
| Ramrod&Sencor + Banvel | 4&.094 + .25 | 83 | 93 | -- | -- |
| Ramrod&Shotgun | 4 + 1.21 | 92 | 98 | -- | -- |
| Ramrod&Permit + X-77 | 4&.032 + .5% | 89 | 85 | -- | -- |
| Ramrod&CGA-152005 + COC | 4&.0357 + 1 qt | 85 | 96 | -- | -- |
| Ramrod&Beacon + Banvel + X-77 | 4&.0178(3/8 oz) + .125 + .25% | 93 | 85 | -- | -- |
| Lasso&Resource + atrazine + COC + 28% N | 2&.0269 + .5 + 1 qt + 2 qt | 90 | 99 | -- | -- |
| POSTEMERGENCE | | | | | |
| Accent + COC + 28% N | .0313 + 1% + 4% | 76 | 82 | 70 | 65 |
| Accent + Marksman + COC | .0313 + .77 + 1 | 60 | 96 | -- | -- |
| Pursuit + Sun-It II + 28% N | .063 + 1 qt + 1 | 81 | 97 | -- | -- |
| Pursuit + atrazine + Sun-It II + 28% N | .063 + 1 + 1 qt + 1 qt | 90 | 99 | -- | -- |
| PREEMERGENCE | | | | | |
| Dual II | 1.25 | 68 | 36 | -- | -- |
| Lasso | 1.5 | 66 | 58 | -- | -- |
| Harness Plus | 1(1.14 pt) | 88 | 80 | -- | -- |
| Surpass | 1(1.25 pt) | 87 | 84 | -- | -- |
| Frontier | .75(.8 pt) | 66 | 48 | -- | -- |
| POSTEMERGENCE | | | | | |
| Accent + COC + 28% N | .0156 + 1% + 4% | 52 | 58 | -- | -- |

Table 33. Soybean Herbicide Demonstration

Demonstration
Planting Date: 5/26/94
PPI, SPPI, PRE: 5/26/94
POST: 6/29/94
LPOST: 7/6/94
Soil: Silty Clay Loam; 3.2% OM; 6.3 pH

Precipitation: 1st week: 0.00 inches
2nd week: 0.61 inches

Weeds: Yeft = Yellow foxtail
Rrpw = Redroot pigweed

COMMENTS: Moderate, uniform grass and broadleaf weed pressure. Conditions favored incorporated or postemerge treatments compared to several preemergence for grass control. Reduced rates of Treflan and Pursuit did not perform as well as full rates. Only two treatments provided 90% or greater control of both grasses and broadleaves in 1994.

| | | %Yeft | %Rrpw | 3-Yr Ave | |
|---|---|---|---|---|---|
| Treatment | lb/A act. | 7/26 | 7/26 | Gr | Bdlf |
| Check | ---- | 0 | 0 | 0 | 0 |
| PREPLANT INCORPORATED | | | | | |
| Prowl + Pursuit | .875(2.12pt) + .063 | 95 | 99 | 93 | 99 |
| Pursuit | .063(4 oz) | 85 | 98 | 86 | 96 |
| Treflan | .75 | 89 | 91 | 87 | 81 |
| Sonalan | 1 | 92 | 94 | 87 | 83 |
| Prowl | 1.25 | 91 | 91 | 83 | 63 |
| Treflan + Sen/Lex | .75 + .38 | 95 | 99 | 88 | 83 |
| Treflan + Command | .75 + .75 | 89 | 95 | -- | -- |
| Treflan + Pursuit | .75 + .063 | 91 | 99 | 93 | 98 |
| Broadstrike/Treflan | .91(2 pt) | 87 | 95 | -- | -- |
| Prowl + Pursuit | 1.25 + .032(2 oz) | 90 | 98 | 88 | 90 |
| Treflan + F6285 | .75 + .375 | 88 | 97 | -- | -- |
| SHALLOW PREPLANT INCORPORATED | | | | | |
| Broadstrike/Dual | 2.166(2.25 pt) | 80 | 83 | -- | -- |
| Lasso + Treflan | 2 + .25 | 76 | 82 | 72 | 65 |
| SHALLOW PREPLANT INCORPORATED & POSTEMERGENCE | | | | | |
| Command&Pursuit + Sun-It II + 28% N | .75&.031 + 1 qt + 1 qt | 94 | 99 | -- | -- |
| PREPLANT INCORPORATED & PREEMERGENCE | | | | | |
| Treflan + Sen/Lex&Sen/Lex | .75 + .25&.38 | 94 | 96 | 90 | 92 |
| Treflan&Sen/Lex | .75&.5 | 89 | 91 | 88 | 89 |
| PREPLANT INCORPORATED & POSTEMERGENCE | | | | | |
| Pursuit& Pursuit + Sun-It II + 28% N | .032& .032 + 1 qt + 1 qt | 82 | 96 | -- | -- |
| Prowl& Pursuit + Sun-It II + 28% N | 1& .063 + 1 qt + 1 qt | 97 | 99 | -- | -- |

Table 33. Continued. . .

| Treatment | lb/A act. | % Yeft 7/26 | %Rrpw 7/26 | 3-Yr Ave Gr | 3-Yr Ave Bdlf |
|---|---|---|---|---|---|
| PREEMERGENCE | | | | | |
| Lasso | 3 | 81 | 88 | 81 | 63 |
| Dual II | 2.5 | 78 | 79 | 82 | 47 |
| Frontier | 1.5(1.6 pt) | 77 | 83 | -- | -- |
| Broadstrike/Dual | 2.166 | 72 | 80 | -- | -- |
| Pursuit | .063 | 66 | 92 | 73 | 90 |
| Lasso + Sen/Lex | 2 + .5 | 73 | 91 | 79 | 75 |
| Dual II + Sen/Lex | 2 + .5 | 76 | 90 | 80 | 72 |
| Lasso + Pursuit | 2 + .063 | 74 | 92 | 83 | 88 |
| Lasso + Lorox | 2 + 1 | 64 | 79 | 63 | 61 |
| Dual II + Pursuit | 1.25 + .063 | 75 | 93 | -- | -- |
| PREEMERGENCE & POSTEMERGENCE | | | | | |
| Lasso&Basagran + COC | 2&1 + 1 qt | 66 | 91 | 69 | 86 |
| Lasso&Blazer + X-77 | 2&.38 + .5% | 72 | 95 | 75 | 80 |
| Lasso&Resource + Cobra + COC | 2&.0264 + .094(6 oz) + .5% | 74 | 93 | -- | -- |
| Lasso&Cobra + COC | 2&.2(.8 pt) + .5 qt | 76 | 84 | 71 | 75 |
| Lasso&Galaxy + X-77 | 2&.92(2 pt) + .5% | 75 | 90 | -- | -- |
| Lasso&Pinnacle + X-77 | 2&.0039(1/4 oz) + .25% | 78 | 89 | 70 | 79 |
| Lasso&Classic + X-77 | 2&.0117(3/4 oz) + .25% | 80 | 80 | 72 | 54 |
| Lasso&Concert + X-77 + 28% N | 2&.0078(1/2 oz) + .25% + 1 qt | 78 | 90 | 73 | 88 |
| Lasso&Basagran + Pursuit + COC | 2&.5 + .032 + 1 qt | 90 | 93 | 89 | 84 |
| Lasso&Pinnacle + Pursuit + X-77 | 2 + .0039 + .047 + .25% | 88 | 96 | -- | -- |
| POSTEMERGENCE | | | | | |
| Poast Plus + COC | .187(1.5 pt) + 1 qt | 92 | 0 | 95 | 0 |
| Poast Plus | .187 | 78 | 0 | -- | -- |
| Option II + COC | .079(.8 pt) + 1 qt | 95 | 0 | 96 | 0 |
| Select + COC | .094(6 oz) + 1 qt | 89 | 0 | 93 | 0 |
| PREPLANT INCORPORATED | | | | | |
| Treflan | .38 | 75 | 79 | -- | -- |
| Pursuit | .032 | 69 | 88 | -- | -- |
| Treflan + Pursuit | .38 + .032 | 85 | 95 | -- | -- |
| POSTEMERGENCE | | | | | |
| Fusilade + COC | .187(1.5 pt) + 1 qt | 77 | 0 | 87 | 0 |
| Fusion + COC | .166(.5 pt) + 1 qt | 94 | 0 | 95 | 0 |
| Assure II + COC | .048(7 oz) + 1 qt | 94 | 0 | 93 | 0 |

Table 33. Continued. . .

| Treatment | lb/A act. | % Yeft 7/26 | %Rrpw 7/26 | 3-Yr Ave Gr | 3-Yr Ave Bdlf |
|---|---|---|---|---|---|
| POSTEMERGENCE | | | | | |
| ~~Pursuit + Sun-It II +~~ 28% N | .063+ 1 qt + 1 qt | 85 | 88 | 89 | 87 |
| Pursuit | .063 | 70 | 76 | -- | -- |
| Poast Plus + Galaxy + COC | .2815(2.25 pt) + .92 + 1 qt | 91 | 86 | -- | -- |
| Poast Plus + Galaxy + Solubor + 28% N | .2815 + .92 + .25+ 1 qt | 91 | 88 | -- | -- |
| Assure II + Concert+ X-77 + 28% N | .062 + .0078 + .25% + 1 qt | 57 | 96 | 63 | 95 |
| POSTEMERGENCE & LATE POSTEMERGENCE | | | | | |
| Galaxy&Poast Plus + COC | .92&.2815 + 1 qt | 87 | 87 | -- | -- |
| Poast Plus + COC&Galaxy | .2815+ 1 qt&.92 | 89 | 81 | -- | -- |
| | LSD(.05) | | | 14 | 25 |

Table 34. Foxtail Control in Spring Wheat

RCB; 4 Reps
Planting Date: 4/22/94
FALL: 10/27/93
POPI: 4/22/94
2-4 LEAF: 5/26/94
TILL: 6/9/94
Soil: Silty clay loam; 3.2% OM; 6.3 pH

Precipitation: 1st week: 1.42 inches
2nd week: 0.21 inches

Weeds: VCRR = Visual Crop Response rating
Wioa = Wild Oat
Grft = Green Foxtail

COMMENTS: Moderate foxtail; light wild oat pressure. Several treatments showed significant crop response (stunting, stand reduction); however yields generally exceeded the check unless foxtail control was poor. Note antagonism from 2,4-D with Hoelon; note the superior performance of Tiller early compared to later application. Level of foxtail control was the primary factor affecting yield.

| Treatment | lb/A act. | %VCRR 7/26 | % Wioa 7/26 | %Grft 7/26 | Yield Bu/A 8/15 | Test Wt. lb/bu 8/15 |
|---|---|---|---|---|---|---|
| Check | ---- | 0 | 0 | 0 | 21 | 58 |
| FALL | | | | | | |
| Treflan | .75 | 23 | 33 | 64 | 26 | 58 |
| Treflan 10G | .75 | 23 | 42 | 74 | 24 | 57 |

Table 34. (Continued)

| Treatment | lb/A act. | %VCRB 7/26 | % Wioa 7/26 | %Grft 7/26 | Yield Bu/A 8/15 | Test Wt. lb/bu 8/15 |
|---|---|---|---|---|---|---|
| ~~Far-go 10G~~ | 1.25 | 14 | 58 | 0 | 19 | 58 |
| Far-go | 1.25 | 18 | 65 | 0 | 20 | 59 |
| POSTPLANT INCORPORATED | | | | | | |
| Treflan | .75 | 14 | 13 | 61 | 26 | 58 |
| Far-go | 1.25 | 24 | 47 | 0 | 19 | 58 |
| 2-4 LEAF | | | | | | |
| Hoelon + COC | .75+ 1 pt | 0 | 98 | 71 | 28 | 58 |
| Hoelon + COC + 2,4-D amine | .75+ 1 pt + .5 | 0 | 65 | 45 | 28 | 59 |
| Hoelon | 1 | 0 | 94 | 65 | 27 | 59 |
| Tiller | .41 | 0 | 98 | 84 | 30 | 59 |
| Tiller | .34 | 0 | 97 | 79 | 29 | 58 |
| Assert | .38 | 0 | 80 | 0 | 20 | 58 |
| Stampede+ MCPA ester + COC | 1 + .25+ 1 pt | 3 | 0 | 46 | 24 | 58 |
| Dakota | .41 | 13 | 66 | 71 | 27 | 59 |
| Cheyenne + Harmony Extra | .46+ .014 | 24 | 97 | 80 | 22 | 58 |
| Tiller + Banvel | .41 + .063 | 13 | 81 | 83 | 28 | 59 |
| TILLER | | | | | | |
| Hoelon + COC | .75+ 1 pt | 5 | 94 | 83 | 25 | 59 |
| Tiller | .41 | 31 | 98 | 87 | 22 | 58 |
| Dakota | .41 | 30 | 81 | 83 | 21 | 59 |
| | LSD(.05) | 8 | 8 | 6 | 5 | 2 |

Table 35. Sunflower Herbicide Demonstration

RCB; 2 Reps
Planting Date: 5/26/94
PPI, SPPI, PRE: 5/26/94
POST: 6/6/94

Precipitation: 1st week: 0.00 inches
2nd week: 0.61 inches

Weeds: VCRR = Visual Crop Response rating
Yeft = Yellow Foxtail
BDLF = Mustard, pigweed

Soil: Silty clay loam; 3.2% OM; 6.3 pH

COMMENTS: Uniform weed pressure. Broadleaf control was inadequate for many treatments. Rate response noted for Treflan rates. Trific granules were incorporated immediately; performance is improved with a delay between passes. Crop stunting noted for 2,4-D prior to planting. Prowl was most effective as a PPI treatment.

| Treatment | lb/A act. | %VCRR 7/26 | % Yeft 7/26 | %BDLF 7/26 | 3-Yr Ave Gr | 3-Yr Ave Bdlf |
|---|---|---|---|---|---|---|
| Check | — | 0 | 0 | 0 | 0 | 0 |
| PREPLANT INCORPORATED | | | | | | |
| Eptam | 3 | 0 | 50 | 38 | 69 | 46 |
| Sonalan | 1 | 0 | 86 | 68 | 89 | 79 |
| Treflan | .5 | 0 | 73 | 38 | 78 | 59 |
| Treflan | .75 | 0 | 79 | 50 | 83 | 69 |
| Treflan | 1 | 0 | 86 | 55 | 87 | 74 |
| Treflan | 3 | 0 | 94 | 70 | -- | -- |
| Trific 10G | .75 | 0 | 55 | 50 | -- | -- |
| Prowl | 1.25 | 0 | 85 | 65 | 83 | 61 |
| SHALLOW PREPLANT INCORPORATED | | | | | | |
| Prowl | 1.25 | 0 | 74 | 65 | 74 | 64 |
| PREEMERGENCE | | | | | | |
| Prowl | 1.25 | 0 | 73 | 60 | 66 | 59 |
| Prowl+2,4-D ester | 1.25+1 | 20 | 73 | 85 | -- | -- |
| POSTEMERGENCE | | | | | | |
| Poast+Dash | .187+1 qt | 0 | 88 | 0 | 93 | 0 |
| Blazer | .125 | 0 | 0 | 95 | -- | -- |
| Poast+Assert+COC | .187+.38+1 qt | 0 | 84 | 85 | -- | -- |
| | LSD(.05) | 0 | 7 | 13 | 10 | 14 |

Table 36. Primary Herbicide Screen - Oats

RCS; 4 Reps
Planting Date: 4/22/94
TILL: 6/9/94
Soil: Silty clay loam; 3.2% OM; 6.3 pH

Precipitation: 1st week: 1.42 inches
2nd week: 0.21 inches

COMMENTS: Continuing project to evaluate tolerance of oat varieties to primary herbicides. Data presented is a summary across all varieties tested. All treatments except MCPA amine at labeled rate reduced oat height; however yield and test weight was not affected in 1994.

| Treatment | lb/A act. | Plant Ht. Inches | Yield Bu/A | Test Wt. lb/bu |
|---|---|---|---|---|
| Check | — | 41 | 89 | 33 |
| MCPA amine | .5 | 41 | 89 | 33 |
| MCPA amine | 1 | 39 | 93 | 35 |
| 2,4-Damine | .5 | 39 | 89 | 34 |
| 2,4-D amine | 1 | 37 | 81 | 33 |
| Bronate | .75 | 38 | 91 | 32 |
| Bronate | 1.5 | 37 | 88 | 32 |
| Banvel+MCPA amine | .125+.25 | 39 | 90 | 32 |
| Banvel+MCPA amine | .25+.5 | 38 | 82 | 30 |
| | LSD(.05) | 1 | 11 | 2 |

Table 37. No-Till Corn Weed Control

RCB; 2 Reps
Planting Date: 5/12/94
FALL: 10/27/93
EPP: 4/21/94
PRE: 5/12/94
EPOST: 5/26/94
POST: 6/9/94
Soil: Clay Loam; 3.9% OM; 6.0 pH

Precipitation: 1st week: 0.93 inches
2nd week: 0.98 inches

Weeds: Yeft = Yellow foxtail
BDLF = Broadleaves

COMMENTS: Treatments established in wheat stubble. Roundup burndown applied fall 1993. Annual broadleaf complex of kochia, lambsquarter, pigweed and wild buckwheat. Broadleaf control was more consistent than for grass. EPP/PRE split treatments with early spring atrazine and a grass herbicide or split treatments using postemergence herbicides were effective. Moderate to heavy weed pressure; typical of initial no-till situations. Yields were statistically similar.

Table 37. No- Till Corn Weed Control

| FALL | EARLY PREPLANT | PREEMERGENCE | POSTEMERGENCE | % YeFt 7/26 | % BDLF 7/26 | Yield Bu/A 11/2 | Test Wt. lb/bu 11/2 |
|---|---|---|---|---|---|---|---|
| Atrazine(2) | | | | 87 | 88 | 92 | 53 |
| Atrazine(1)+Dual(2.5) | | | | 76 | 87 | 78 | 54 |
| Atrazine(1) | Dual II(2.75) | | | 81 | 88 | 92 | 54 |
| Atrazine(1) | | Dual II(2.75) | | 84 | 93 | 104 | 53 |
| | Atrazine(1)+Dual II(2.75) | | | 84 | 93 | 94 | 54 |
| | Atrazine(1)+Micro-tech(3.25) | | | 81 | 98 | 91 | 54 |
| | Atrazine(1)+Frontier 1.5(1.6 pt) | | | 77 | 96 | 97 | 57 |
| | Atrazine(1)+Surpass 2.4(3 pt) | | | 79 | 96 | 81 | 54 |
| | Atrazine(1)+Harness Plus 2.4(2.75 pt) | | | 78 | 96 | 82 | 55 |
| | Atrazine(1)+Prowl(1.5) | | | 83 | 95 | 85 | 52 |
| | Atrazine(1) | Dual II(2.75) | | 89 | 97 | 101 | 53 |
| | Broadstrike/Dual 2.4(2.5 pt) | | | 80 | 87 | 73 | 54 |
| | Atrazine(.25)+Bladex(.75)+ Dual(1.25) | Atrazine(.25)+Bladex(.75)+ Dual II(1) | | 90 | 98 | 91 | 53 |
| | Atrazine(.5)+Bladex(1.5) | | Atrazine(.5)+Bladex(1.5)+ COC(1 qt) | 95 | 98 | 80 | 53 |
| | | Gramoxone(.5)+X-77(.5%)+ Atrazine(.5)+Bladex(1.5)+ Dual II(2.25) | | 81 | 95 | 90 | 54 |
| | | Gramoxone(.5)+X-77(.5%)+ Atrazine(1)+Bladex(2)+ Acetochlor(2) | | 70 | 89 | 85 | 57 |
| | | Gramoxone(.5)+X-77(.5%)+ Micro-tech(2.5) | Atrazine(1.5)+COC(1 qt) | 96 | 98 | 100 | 54 |
| | | Gramoxone(.5)+X-77(.5%) | Accent .031(2/3 oz)+ X-77(.25%)+ 28% N(4%)+Banvel(.25) | 84 | 98 | 83 | 54 |
| | LSD(.05) | | | 12 | 5 | 23 | 3 |

Table 38. No-Till Soybean Herbicides

RCB; 2 Reps
Planting Date: 5/12/94
FALL: 10/27/93
EPP: 4/21/94
PRE: 5/12/94
EPOST: 5/26/94
POST: 6/9/94
Soil: Clay Loam; 3.9% OM; 6.0 pH

Precipitation: 1st week: 0.93 inches
2nd week: 0.98 inches

Weeds: Yeft = Yellow foxtail
BDLF = Broadleaves

COMMENTS: Plots established in wheat stubble. Moderate to heavy weed pressure. Several treatments provided only 70-85% grass control; only one treatment exceeded 90%. Follow-up grass control would be required to provide acceptable control; broadleaf control tended to be more consistent.

Table 38. No-Till Soybean Herbicides

| FALL | EARLY PREPLANT | PREEMERGENCE | POSTEMERGENCE | %Yeft 7/26 | % Pesw 7/26 | %Yeft 8/29 |
|---|---|---|---|---|---|---|
| Pursuit(.063)+Prowl(1.5) | | | | 86 | 92 | 85 |
| Pursuit(.063)+Prowl(.875) | | | | 86 | 95 | 85 |
| Pursuit(.063) | | | | 70 | 92 | 71 |
| | Pursuit(.063) | | | 80 | 94 | 80 |
| | Pursuit(.063)+Prowl(1.5) | | | 93 | 95 | 90 |
| | Prowl(1.5) | | Pursuit(.063)+Sun-It II (1 qt)+28% N(1 qt) | 89 | 94 | 89 |
| | Prowl(1.5) | | | 48 | 35 | 55 |
| | Broadstrike/Dual(2.4) | | | 67 | 70 | 65 |
| | Prowl(1.5)+Sen/Lex(.5) | | | 83 | 87 | 64 |
| | Frontier(1.5)+Sen/Lex(.5) | | | 55 | 85 | 50 |
| | Dual II(2.5)+Sen/Lex(.5) | | | 72 | 88 | 74 |
| | Prowl(1.5) | | Pursuit(.032)+Sun-It II (1 qt)+28% N(1 qt) | 77 | 83 | 79 |
| | Command(.75) | | Pursuit(.032)+Sun-It II (1 qt)+28% N(1 qt) | 82 | 90 | 84 |
| | | Sen/Lex(.187)+2,4-D ester(.25) | Pursuit(.032)+Sun-It II (1 qt)+28% N(1 qt) | 81 | 95 | 82 |
| | | Gramoxone(.5)+X-77(.5%) | Pursuit(.063)+Sun-It II (1 qt)+28% N(1 qt) | 82 | 95 | 82 |
| | | Gramoxone(.5)+X-77(.5%) | Pursuit(.032)+Sun-It II (1 qt)+28% N(1 qt) | 78 | 95 | 78 |
| | | Gramoxone(.5)+X-77(.5%)+ Dual II(2.5)+Sen/Lex(.5) | | 73 | 94 | 72 |
| | | Roundup(.38)+X-77(.5%)+AS(2%)+ Micro-tech(3)+Sen/Lex(.5) | | 73 | 94 | 72 |
| | Pursuit(.032) | Pursuit(.032)+Sun-It II(1 qt) +28% N(1 qt) | | 77 | 94 | 78 |
| | | Roundup(.187)+2,4-D ester(.25)+ X-77(.5%) | Concert(.0032)+Basagran (.75)+Poast Plus(.188)+ 28% N(.5%) | 87 | 96 | 86 |
| | | | Concert(.0032)+Basagran (.75)+Poast Plus(.188)+ 28% N(.5%) | 74 | 80 | 67 |
| | | | Pursuit(.063)+Sun-It II (1 qt)+28% N(1 qt) | 72 | 75 | 72 |
| | | LSD(.05) | | 12 | 11 | 13 |

## Buckwheat/Phosphorus Study

J. Smolik, L. Evjen and A. Heuer

Objectives: Measure response of two buckwheat varieties to phosphorus fertilizer

Methods: The previous crop in the study area was alfalfa which had been incorporated the previous fall by chisel plowing twice. Soil test results in fall 1993 were 97-14-282 lbs (N-P-K). The P levels (14 lbs) are considered low and half of the plots were fertilized with 30 lbs P/A. Following incorporation of the fertilizer by field cultivating and harrowing, two buckwheat varieties (Manor or Mancan) were seeded at 40 lbs/A in 7 inch rows on 6 June. Each of the four treatments (Manor or Mancan plus or minus P fertilizer) was replicated five times in a randomized complete block design. Individual plots were 14' wide and 60' long. An eight foot swath was harvested from the center area of each plot on 9 September for yield determination.

Results: There were no significant differences in yield between any of the treatments (Table 39). At harvest we observed substantially more lodging in the treatments receiving 30 lbs P (approximately 10% lodged in non-fertilized vs 50-80% lodged in fertilized). However, the increase in lodging did not significantly influence yields.

Table 39. Response of two buckwheat varieties to phosphorus fertilizer.

| | Yield (lb/A) | |
|---|---|---|
| Variety: | 0 lbs P/A | 30 lbs P/A |
| Manor | 855[a] | 824 |
| Mancan | 860 | 785 |
| Flsd.05 = N.S. | | |

[a] Average of five replications.

## Mechanical/Chemical Weed Control in Soybeans

J. Smolik, L. Evjen, and A. Heuer

Objectives: Compare effectiveness of mechanical and chemical weed control methods in soybean and effects on soybean yield.

Methods: The previous crop in the study area was forage oats which had been chisel plowed the previous fall. The plot area was field cultivated and harrowed prior to planting soybean variety Simpson at 180,000 seeds/A in 30 inch rows on 13 May. Each of the four treatments (Check, Cultivate 1 x, Cultivate 2 x, and Lasso II 7 lbs band plus Cultivate 2 x) were replicated four times in a randomized complete block design. Individual plots were 4 rows wide and 50' long. The first cultivation was 2 June and second cultivation on 27 June. Weed populations were measured on 31 August. Plots were harvested 27 September.

Results: All of the weed control treatments significantly increased soybean yield compared to the check (Table 40). However, yield differences among the weed control methods were not different. Both numbers and biomass of grassy weeds were significantly reduced by all the weed control methods, but differences in broadleaf numbers and biomass were not significant.

Results in this study were similar to those obtained in previous years, and they suggest that mechanical methods of weed control can provide acceptable levels of weed control in soybean.

Table 40 . Effect of mechanical and chemical weed control treatments on weed populations and yield of soybean.

| Treatment | Yield (bu/A) | Weed No./$9ft^2$ Grass | Weed No./$9ft^2$ Bdlf | Weed Biomass (Dry wt - lb/A) Grass | Weed Biomass (Dry wt - lb/A) Bdlf |
|---|---|---|---|---|---|
| Check | 23.1[a] | 146 | 16 | 1588 | 1098 |
| Cult 1x | 30.0 | 42 | 15 | 650 | 906 |
| Cult 2x | 32.3 | 27 | 3 | 267 | 170 |
| Lasso II, 7lbs band + Cult 2x | 31.9 | 29 | 5 | 288 | 746 |
| Flsd.05 = | 5.6 | 77 | NS | 447 | NS |

[a] Average of four replications. Grass was primarily green and yellow foxtail, broadleaves (Bdlf) were primarily redroot pigweed, kochia, lambsquarter, and Russian thistle.

Note: This study was supported, in part, through the Floyd Linhart Research Fund established through the SDSU Foundation.

## Soybean Row Space Study

J. Smolik, L. Evjen, and A. Heuer

Objectives: Compare effects of row spacing on yield and morphology of two soybean varieties.

Methods: The previous crop in the study area was spring wheat and the stubble had been chisel plowed the previous fall. Sonalan was applied at 1.5 pt/A (actual) and incorporated by discing once followed by field cultivation and harrowing. Two soybean varieties, Simpson (Group 0) and Parker (Group I), were seeded on 12 May at 180,000 seeds/A in three row spacings: 7 inch, 30 inch and 36 inch. The 7 inch treatment was seeded with a press drill. Individual plots were 24' wide and 70' long. The experiment was a 2 x 3 factorial arranged in a randomized complete block design with four replications. The 30 and 36 inch row apacings were cultivated once. Immediately prior to harvest, 10 plants were removed at random from each plot and various growth parameters were recorded. Yields were determined by harvesting a 13' wide swath from the center area of the 7 inch spacings, 5 rows from the 30" spacings, end 4 rows from the 36" spacings. Variety Simpson was harvested on 26 September and Parker on 12 October.

Results: Soybean yields were very good in all treatments (Table 41). Yields of Parker were significantly higher than Simpson and the 7 inch spacing was the highest yielding treatment for both varieties. The morphology of the soybean plants was also significantly different between varieties and row spacings. Parker was significantly taller than Simpson, and the tallest plants in both varieties occurred in the 7 inch spacing. There was very little difference in height between the 30 and 36 inch spacings. The total number of nodes per plant was highest in Parker and lowest in the 36 inch spacing in both varieties (Table 41). The distance between nodes 1- 7 was not significantly different between varieties or row spacings. Seed weight per plant was highest in Parker and highest in the 7 inch spacing for both varieties. The total number of pods containing seed per plant was not significantly different between varieties, but was significantly higher in the 7 inch spacings. The weight of 100 seeds was significantly higher for Parker, but was not influenced by row spacing. The calculated number of seeds per pod was highest in the 36 inch row spacings, but was not consistently different between varieties. Plant stand at harvest was significantly higher in the 7 inch spacings, and on average was slightly higher for Parker. None of the interactions between variety and spacing were statistically significant.

Although Parker out-yielded Simpson in this study, it should be noted that Group I varieties do not always reach physiological maturity before a killing frost occurs at this location.

The soybean variety Simpson was included in all row space studies conducted over the past five years. Yield of Simpson at various row spacings is summarized in Table 42 . Not all spacings were included in every year, and the year to year variation in soybean yield was substantially greater than the row space effect. Nevertheless, it does appear that in years that are highly favorable for soybeans, (i.e. 1991 and 1994) yields will be higher in 7 inch row spacings.

Table 41. Effect of row spacing on yield and morphology of two soybean varieties.

| Variety | Simpson | | | Parker | | | "F" Test Variety | "F" Test Spacing |
|---|---|---|---|---|---|---|---|---|
| Row Spacing | 7" | 30" | 36" | 7" | 30" | 36" | | |
| Yield (Bu/A) | 48.8\[a] | 46.8 | 44.1 | 56.8 | 49.6 | 47.2 | 214.1** | 126.6** |
| Height (cm) | 80.6[b] | 73.6 | 75.1 | 97.3 | 87.1 | 86.5 | 30.3** | 4.49* |
| Nodes/plant | 18.5 | 15.3 | 13.3 | 20.3 | 20.6 | 18.0 | 25.4** | 7.92** |
| Distance from nodes 1-7(cm) | 50.7 | 46.4 | 50.9 | 53.5 | 47.7 | 50.9 | NS | NS |
| Seed wt. per plant (g) | 13.5 | 12.4 | 11.2 | 15.6 | 15.3 | 13.1 | 14.36** | 5.17* |
| Total pods with seed | 44.9 | 38.0 | 32.4 | 39.9 | 37.7 | 32.8 | NS | 15.36** |
| 100 seed weight (g) | 14.46 | 14.57 | 14.94 | 17.91 | 18.27 | 17.89 | 101.89** | NS |
| Seeds/pod (calculated) | 2.07 | 2.23 | 2.31 | 2.18 | 2.22 | 2.23 | ——— | ——— |
| Stand (1000's/A) | 170 | 139 | 157 | 184 | 152 | 160 | 5.92* | 20.75** |

[a]/ Average of four replications
[b]/ Average of 10 replications * = Significant at .05 level of probability, ** = Significant at .01 level

Table 42. Influence of row spacing on yield of Simpson Soybeans, Northeast Research Station, 1990-1994.

| Year | Yield (Bu/A) Row Spacing: 7" | 14" | 21" | 30" | 36" |
|---|---|---|---|---|---|
| 1990 | 39.5 | | 33.9 | | 38.9 |
| 1991 | 51.1 | 44.9 | 46.5 | 45.6 | 39.1 |
| 1992 | 29.1 | 25.7 | | | 30.7 |
| 1993 | | | | 28.5 | 27.3 |
| 1994 | 48.8 | | | 46.8 | 44.1 |

# Rotation Studies

J. Smolik, L. Evjen and A. Heuer

Objectives: Compare the long-term effects of various cropping systems on crop yields, soil nutrient levels, and pest populations.

Methods: This study is, in part, a continuation of the Farming Systems studies that were concluded in 1993. It includes several of the rotations used in the earlier study plus several others. Plots are somewhat larger in this study (24' wide by 120' long) to facilitate certain field operations. A total of seven "systems" will be compared in non-replicated demonstration plots. All crops within a system are represented each year of the study. Two conventional (Conv) systems are included. Conv I, a corn-soybean-spring wheat rotation and Conv II, a corn-soybean rotation. The Conv systems receive recommended inputs of fertilizer and pesticides and the moldboard plow is used to incorporate corn and spring wheat residue. A minimum-till (M-T) corn-soybean system is also included. The M-T system receives recomended inputs of fertilizer and pesticides and a chisel plow is used to incorporate corn residue. A non-rotated continuous hay system is a mix of alfalfa and red clover and will be harvested approximately three times per year (depending on precipitation). Fertilizer will be applied in this system based on soil tests and current recommendations. Three alternate (organic) systems are also included. Alt - I is a four-year rotation of oats/alfalfa - alfalfa - soybeans - corn, Alt II is a oat/clover - clover (green manure) - soybean - spring wheat rotation, and Alt III is a five year oats/clover - clover (green manure) - spring wheat - soybean - spring wheat rotation. No commercial fertilizer or pesticide is applied in the Alt systems. These three systems also do not use a moldboard plow, and a chisel plow with sweeps is used to incorporate crop residue. The previous crop in the study area was forage oats and a portion of the area had been overseeded with a alfalfa/clover mix. The forage oats were harvested in late July and approximately 6 weeks later the entire plot area, except for the hay plot, Alt-I alfalfa, and Alt II clover, was chisel plowed. Cultural practices for 1994 are listed in Table 43.

Results: Because this was the establishment year, 1994 yields are of very limited use. Corn and soybean yields were good in all systems and highest corn yield occurred in Conv I and highest soybean yield in M-T, (Table 44). Spring wheat yields were poor, and stands were thin for reasons we were unable to determine. Also, spring wheat yields were further reduced by Fusarium head scab. Oat yields were moderate. Forage legume yields were very good, and the spring-seeded forage legume stands were also very good in fall of 1994.

Soil Test results were highly variable for N, and several of the crops will not require N fertilizer in 1995. All of the crops in the conventional and M-T systems will be fertilized with P at planting in 1995. The highest N levels occurred in the clover (green manure) plot in Alt II (Table 44), indicating that substantial mineralization occurred following incorporation of the clover. The 1994 growing season was substantially longer than usual and rainfall was adequate. This, along with mild temperatures, apparently stimulated above average mineralization of organic matter.

Note: This study is supported, in part, through the Floyd Linhart Research Fund established through the SDSU Foundation.

Table 43. Cultural practices in 1994 Rotation Studies

| System/Crop | Fertilizer | Herbicide | Tillage: Pre-plant | Tillage: Post-Plant |
|---|---|---|---|---|
| Conv. I | | | | |
| Corn | 70 lb N | Lasso II, 7 lbs band | Field cult & harrow | Cult2x, fall moldboard plow |
| Soybean | 30 lb P | Treflan 1.5 pt | Disc 2x & harrow | Cult 2 x, fall chisel plow |
| Spring Wheat | 70 lb N | Bronate, 1 pt | Field cult & harrow | Fall moldboard plow |
| Conv II | | | | |
| Corn | 70 lb N | Lasso II, 7 lbs band | Field cult & harrow | Cult 2x, fall moldboard plow |
| Soybean | 30 lbs P | Treflan 1.5 pt | Disc 2x & harrow | Cult 2x, fall chisel plow |
| M-T | | | | |
| Corn | 70 lb N | Bladex 4L - 2 qt, Lasso 4L 2.5 qt | ---------- | Cult 2x, fall chisel plow<br>Cult 2x |
| Soybean | 30 lb P | Pursuit plus 2.5 pt | ---------- | |
| Hay | 30 lb P | | | |
| Alt - I | | | | |
| Oat/alfalfa | 2.4 T/A manure[a] | | Field cult & harrow | |
| Alfalfa | | | ---------- | Fall chisel plow |
| Soybean | | | Field cult & harrow | Rotary hoe 2x, cult 2x |
| Corn | | | Field cult & harrow | Rotary hoe 2x, cult 2x<br>Fell chisel plow |
| Alt II | | | | |
| Oats/clover | 2.4T/A manure | | Field cult & harrow | |
| Clover | | | ---------- | Chisel plow, (late summer) |
| Soybeans | | | Field cult & harrow | Rotary hoe 2x, cult 2x |
| Spring wheat | | | Field cult & harrow | Rotary hoe 1x, fall chisel plow |
| Alt III | | | | |
| Oats/clover | 2.4 T/A manure | | Field cult & harrow | |
| Clover (soybeans in 1994) | | | Field cult & harrow | Rotary hoe 2x, cult 2x |
| Spring Wheat | | | Field cult & harrow | Rotary hoe 1x, fall chisel plow |
| Soybean | | | Field cult & harrow | Rotary hoe 2x, cult 2x |
| Spring wheat | 2.4 T/A manure | | Field cult & harrow | Rotary hoe 1x, fall chisel plow |

[a] Manure dry weight, fall applied, analysis was 2.17 - 0.655 - 2.4 (% N-P-K).
Note: Conv I, Alt I and Alt II (except for alfalfa and clover) had 1.18 T/A of green manure incorporated in Fall 1993, nutrient analysis (%N-P-K) = 2.38 - .238 - 1.56

Table 44. Crop yields and soil test results in rotation studies

| System/Crop | Yield | N 0-24" | P 0-6" | K 0-6" | % O.M. |
|---|---|---|---|---|---|
| | | Soil Test Results ——lbs/A—— | | | |
| Conv. I | | | | | |
| Corn | 145.4 Bu/A | 163.4 | 16 | 302 | 4.0 |
| Soybean | 42.1 Bu/A | 148.8 | 14 | 294 | 3.8 |
| Spring Wheat | 24.6 Bu/A | 173.2 | 14 | 352 | 3.9 |
| Conv II | | | | | |
| Corn | 130.4 Bu/A | 38.8 | 12 | 318 | 4.0 |
| Soybean | 40.7 Bu/A | 49.2 | 16 | 348 | 4.3 |
| M-T | | | | | |
| Corn | 137.7 Bu/A | 44.8 | 16 | 366 | 3.8 |
| Soybean | 46.0 Bu/A | 70.4 | 14 | 364 | 3.7 |
| Hay: 1.58 + 1.71 + 1.78 = 5.07 T/A[a] | | 178.8 | 12 | 300 | 4.1 |
| Alt I | | | | | |
| Oats/Alfalfa | 69.3 Bu/A | 100.0 | 12 | 326 | 3.9 |
| Alfalfa: 1.39 + 1.97 + 1.54 = 4.90T/A[b] | | 130.8 | 8 | 274 | 3.8 |
| Soybean | 27.1 Bu/A | 185.6 | 12 | 332 | 4.0 |
| Corn | 129.2 Bu/A | 102.4 | 16 | 310 | 3.8 |
| Alt II | | | | | |
| Oats/Clover | 57.0 Bu/A | 25.6 | 10 | 356 | 3.9 |
| Clover (green manure) | 3.16 T/A[c] | 223.6 | 14 | 386 | 4.0 |
| Soybeans | 31.2 Bu/A | 207.6 | 12 | 326 | 4.0 |
| Spring Wheat | 24.9 Bu/A | 30.0 | 14 | 368 | 3.7 |
| Alt III | | | | | |
| Oats/clover | 85.0 Bu/A | 21.2 | 12 | 328 | 4.3 |
| Clover (soybean 1994) | 40.5 Bu/A | 36.4 | 12 | 316 | 4.3 |
| Spring Wheat | 19.8 Bu/A | 38.4 | 12 | 318 | 4.2 |
| Soybean | 37.6 Bu/A | 37.2 | 12 | 312 | 4.2 |
| Spring Wheat | 20.8 Bu/A | 26.8 | 12 | 336 | 4.6 |

a/ Analysis/cut (% N-P-K) = 2.59 - 0.20 - 2.14; 2.62 - .176 - 1.98; 2.90 - .223 - 1.73
b/ Analysis/cut (% N-P-K) = 2.56 - 0.21 - 2.11; 2.35 - .177 - 2.22; 2.87 - .209 - 1.96
c/ Not removed, analysis (% N-P-K) = 1.59 - 0.085 - 1.26

## SPRING WHEAT BREEDING

Jackie Rudd and Brad Farber

The objective of the breeding program is to develop Spring Wheat varieties for South Dakota. Before a new variety is released to South Dakota producers, it must be proven to be superior to existing varieties in grain yield and/or bread-baking quality. Since both of these traits are strongly influenced by the environment, we conduct yield trials at eight locations in the state. Two of the locations are in Northeast, South Dakota. This year we tested 132 advanced lines and 1123 early generation populations at the Northeast Research Station. We also tested the advanced lines on the Johnson farm in northern Day county. Three years of data from these two locations are shown in the table below.

Fusarium Head Blight (commonly known as scab) significantly reduced yields at the Northeast Research Station both in 1993 and 1994. Scab damage was not evident at the Day county site this year end waa only a moderate problem last year. Although none of the commercially available varieties have an acceptable level of resistance to a scab epidemic, some varieties do better than others under moderate scab infection. Of the commonly grown varieties, Sharp and 2375 appear to be the most resistant (it may be more appropriate to say less susceptible) to scab. The Northeast Station has provided us with an excellent opportunity to evaluate our breeding lines for scab resistance. We have identified several lines with better resistance than Sharp and 2375 and I am confident that even further progress can be made. Field evaluation under a scab infection is the best method that we have for identifying scab resistance. This makes our multiple location testing even more essential.

The breeding program is currently considering 2 experimental lines for release as new varieties. SD8073, potential 1995 release, is a Hessian fly resistant line that is similar to Butte 86 in height and appearance and is 1 or 2 days later maturity. SD0010, potential 1996 release, is an early semi-dwarf line that was developed by Pioneer Hi-Bred International. Both of these lines have excellent yield potential and wide adaptation.

Spring Wheat Breeding Advanced Yield Trial

| | NE Station | | Day County | |
|---|---|---|---|---|
| | Yield bu/a | TW lbs/bu | Yield bu/a | TW lbs/bu |
| 1994 | 34.5 | 54.5 | 45.1 | 59.5 |
| 1993 | 27.3 | 51.2 | 44.4 | 56.0 |
| 1992 | 68.0 | 59.2 | 48.0 | 59.2 |